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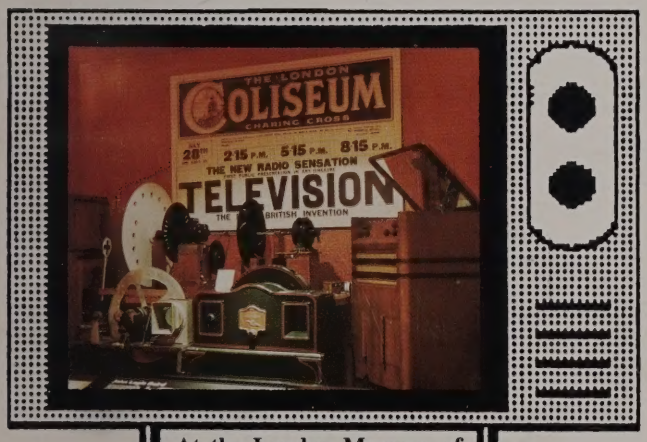

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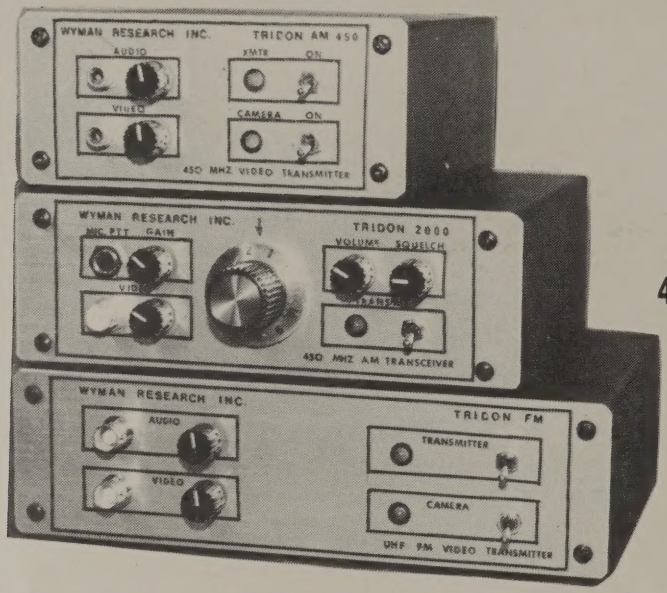

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JULY 1989 AMATEUR TELEVISION QUARTERLY MAGAZINE VOLUME 2 #3
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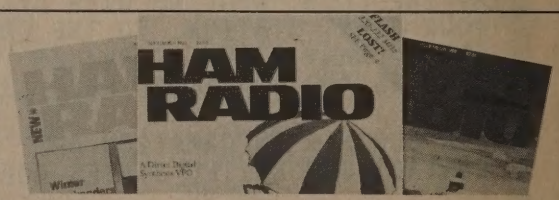

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NEWS

NEW ATV DX RECORD CLAIMED

At 0300 UTC, 13 March. 1989, W5VDS (EM00) and WA4GRK (EL87) made a two way ATV contact (FS-TV) on 1289 Mhz using video with subcarrier audio. Picture quality was P1-P3 with audio. Color was sent but not received. The path was checked on SSB with S-9 +20 signals and high QSB. The distance is calculated at 941 miles (great circle) breaking WA5HNK's and WA4GRK's previous record from Pearland, TX to Pinnellas Park, FL. W5VDS used an IC-1271A, TV1200 a shack GasFET preamp, 35W solid state amp 150' 7/8", 4' diameter dish with backsplash feed at 54' above ground. Field elevation is 1250' AMSL.

COMMERCIALS

G8PTH Andy Emmerson 71 Falcutt Way, Northampton, England NN2 8PH is looking for test patterns and station ID slides from broadcast TV stations. Anyone out there with access to cast-offs? Andy would most appreciate being able to add any stations to his collection. Andy will pay postage or let him know if you want anything from England.

Large collection of broadcast type audio and video equipment. Unless otherwise specified equipment is like new. Most of the microphones are flat black or non glare finish. Price for all equipment is best offer or swap for certain ham gear or broadcast gear. WANTED: LARGE HF AMP, 160-10 FULL LEGAL POWER, NO JUNK, OR HIGH CHANNEL TV TRANSLATOR, MINIMUM 100 WATTS OR C BAND UPLINK HARDWARE OR 2 GHZ COMMERCIAL ICR TV RELAY TRANSMITTER/RECEIVER, ENG viewfinder for Sharp XC-820P pro camera. Also battery or AC supply for camera. (12 volt-15 volt, type 7700 battery). FOR SALE OR SWAP: Prices indicated are asking price or swap value.

CBS 4440 mono Audimax. Very clean, works fine. $200

Ward Beck M605A audio DA and DA tray. Like new. 600 ohm in/out 1 x 6. $150

NLS (Non-Linear Systems) miniscope, model 215, dual trace, 15 Mhz. Fine portable scope. Runs on ni-cads, with charger and probes. X-Y and usual displays. $250.

Cetec Vega wireless mic transmitter, receiver, Sony electret mic, ant, (Pro/R33) complete on 170 Mhz. Like new retail over $2200, Asking $1000.

Sony ECM55B mini lavalier mic, black, like new, $100.

Neuman BS945 phanthom power supply for mic, like new, $75

Neuman N452 fet 80 dual power supply, like new, $100

Shure FP32 stereo mixer, like new, $600.

Shure FP12 headphone briding amp and "IFB" type talent earphone. like new, $150,

Shure FP11, mic to line level amp, like new, $150.

Shure 512 mic/headset, minor cosmetic scratches $50

Audio Technica 4071 capacitor shotgun mic with windscreen $1200 list, asking $600 like new.

Audio Technica 835 electret shotgun with windscreen, $700 list, asking $400.

Audio Technica AT 4073 shotgun with windscreen, $300.

Sennheiser ME80/3KU/MZW30 shotgun, power supply, windscreen. $300.

Sennheiser MKE2-2R micro lavalier, black. $150.

Porta-Brace bag, model cc505P, slight wear, holds pro ENG camera or other goodies. $100

Collection of Audio Technica mic cables. $50 for lot.

Whiteway Sign computer/control terminal. $50

Items are owned by Chicago pro video shooter getting out of business. For any/all above, contact: Henry KB9FO, 540 E. Oakton, Des Plaines, IL 60018 312 298 2269.

FOR SALE

Info-Tech M-6000 multi-mode data receiver $585. WANTED Hameg 103 scope, reasonable. Ron, W9SEK, 602-744-3688, 4020 W. Isis Dr., Tucson, AZ 85741.

CLASSIFIED ADS IN ATVQ ARE FREE TO SUBSCRIBERS.

NEW TV MUSEUM

Irvin, TX. A growing collection of historic communications equipment from Hallicrafters TV sets to a 1900's spark gap transmitter are being displayed at the National Museum of Communications located just down the pike from the D-FW airport. Other items include a video tape machines used by CBS for its first evening news broadcast in 1956. The museum began operating in 1979 when Bill Bragg, an engineer at KDFW-TV in Dallas contributed 41 museum quality pieces from his own collection setting up the museum in office space in downtown Dallas.

NARA OFFERS FREE CODE TAPES!

The National Amateur Radio Association, 16541 Redmond Way, Suite 232, Redmond, WA 98052 is offering a shareware Morse tape set. The program runs on IBM or compatable and features several code learning and speed bnuilding programs. It also operates in interactive mode, ie press 'A' and hear di-dah. For info write or call 206-232-2579.

THEN, NOW & COMMING

Well, the April issue has to be the record holder for size, quality and "a color centerfold (TNX WB8-DMR) ATV Magazine. Needless to say we destroyed the budget for the extra color pages. Our budget size is 48 pages plus cover but as readers know we have had much larger issues than that, thanks to the greater than expected subscriber rate. The more subscribers the bigger the issues it's that simple. We had over 100 pages ready for this issue but to stay in budget we left some out, which will be in the October issue.

HINT: We know that there are ATV'ers out there who don't subscribe to ATVQ, yet. If those of you who do subscribe get your buddies to subscribe, we'll have a bigger budget and can print bigger issues! HINT: the subscription form is on the inside back cover. HINT: Wouldn't it be nice to have a 100+ page April issue in 1990? HINT: You can all collect the $50 bet from another magazine after our October issue.

QUESTION FOR SUBSCRIBERS

We've had a lot of good material and more continues to come in. The question for our readers is: Should ATVQ switch to bi-monthly publication even though it would mean an increase in subscription rates (current subscribers would receive the number of issues paid for)? Say $20/yr/6 issues of ATVQ?

** MICROWAVE OVEN DATA **

WA8EOY has nearly completed his Microwave Oven transmitter. He has been conducting tests to verify operation. He forwarded the readings that are tabulated below. He thought you may wish to review them and keep them on hand for future reference.

Sply. Volt	Mag. Volt	Mag. Mils.	Mod. Volt	Mod. Watt	Mag. Watt
5520	0	0	0	0	0
4452	3414	50	1038	52	172
4320	3484	100	836	83	348
3938	3448	150	490	74	517
3756	3654	175	102	18	639

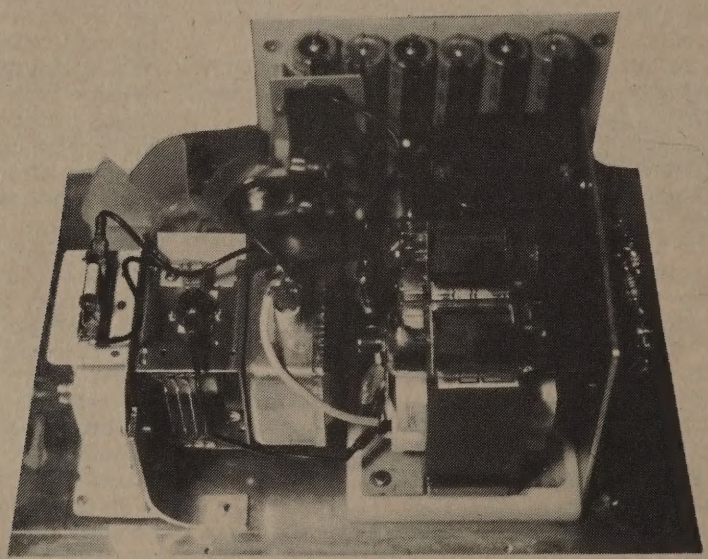
Note: Readings taken without video modulation.

MICROWAVE OVEN NOTE
Bill, W8DMR

For those of you constructing the 2.4 Ghz microwave oven transmitter take note of the LF357 amplifier. The LF 357 will not handle wide band video signals and should be substituted with an ECG 918N or equivalent.

Figure 1. is picture of WA8EOY's transmitter taken by W8DMR as example of homebrew amateur TV construction techniques.

Cooling Fan | High Voltage Rectifiers | Capacitor Bank | Screen Sply. Transformer



N Conn. RF Output | Magnetron Assembly | High Voltage Transformer | Modulator Tubes (2)

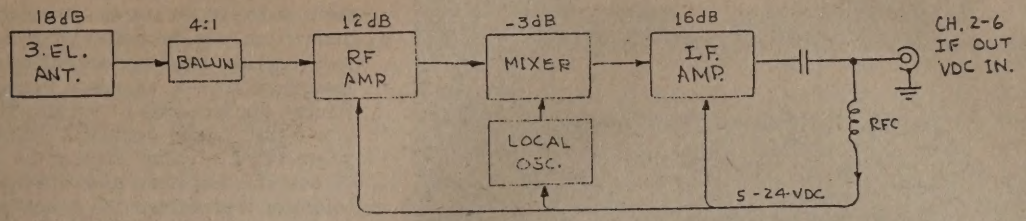
Figure 1. 13 Cm Microwave oven transmitter constructed by WA8EOY.

A 13 CM ATV DOWNCONVERTER

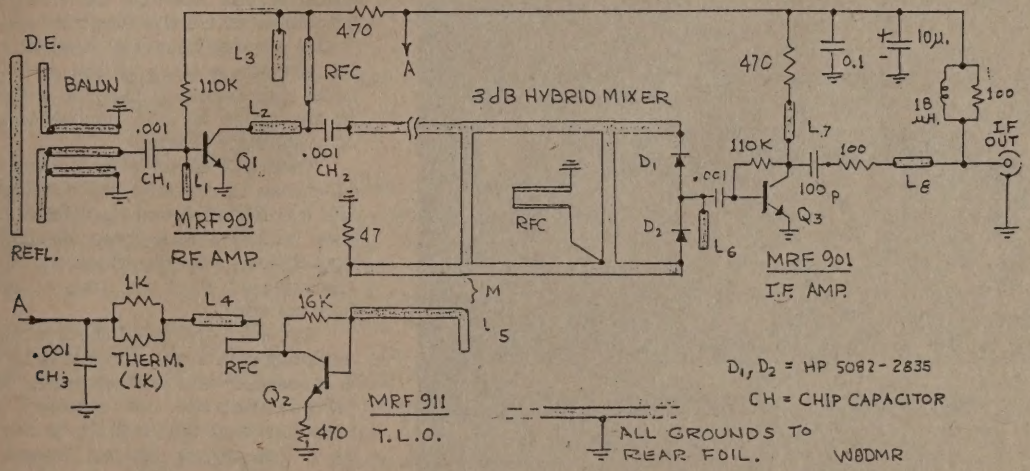
by Bill W8DMR

A downconverter is needed to receive the 2.4 Ghz video signals from the microwave oven ATV transmitter described in earlier ATVQ issues. The gain of this downconverter including gain of the 20 inch parabolic dish is 40+ db. The converter is mounted in the dish antenna. The converter output is in the low VHF TV channel range (2-6). Inexpensive RG 6 coax cable works fine for a downlead. The tuning voltage is from +5 to +24 volts DC.

The gain distribution is shown in the block diagram. The unit has a singly balanced hybrid mixer using hot-carrier diodes. The LO is temperature compensated for stability. An RF and IF amp are included in the downconverter probe. The antenna driven element, reflector and 1/4y balun are also part of the probe.



The downconverter kit can be purchased rom K&S Electronics, PO Box 34522, Phoenix, AZ 85067. The cost of the dish antenna is $23 incl. shipping. The downconverter sells for $27.50 incl. ship. and contains the probe housing, parts, PCB, connector, layout and assembly info. The block diagram and schematic are NOT included. A downconverter power supply schematic is included. It may be fabricated from readily available parts and customized to your particular needs. (Ed. Note: The WA6SVT unit can also be used, elsewhere this issue.)

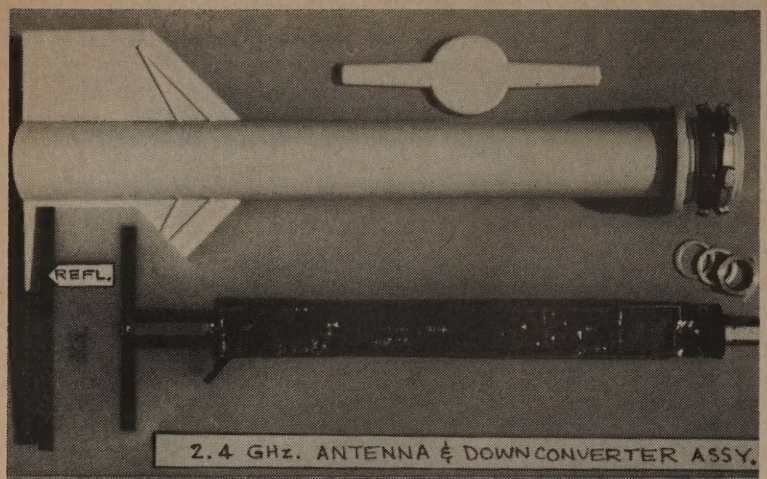


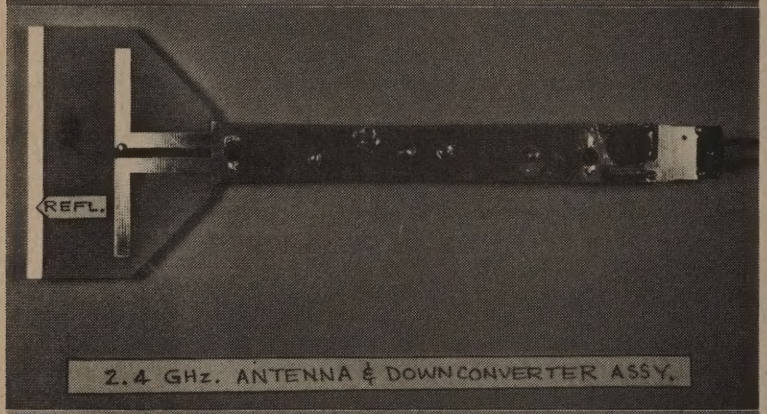
The power supply provides a variable voltage from +5 to +24 VDC for the antenna mounted 2.4 Ghz downconverter. The voltage tunes the unit from about 1.9 to 2.7 Ghz. The lower the voltage the lower the frequency. CW rotation of the pot should tune to higher frequencies. A tuning meter can be added if desired as shown. In the parts list, a few of the bubble pack part numbers contain a quantity of more than 1 item. The do-it-yourselfer cost of the PS is about 1/2 of the manufactured unit. A ready made PS is available from K&S Electronics, PO Box 34522, Phoenix, AZ 85067 for $37.50 pp. A purchased supply does not come with schematic.

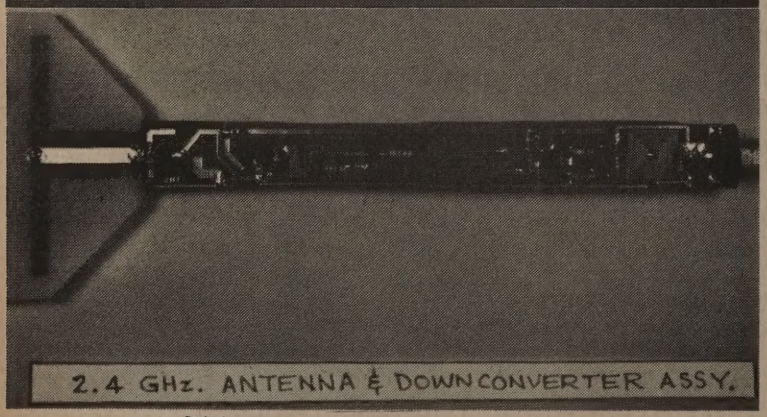
Downconverter Power Supply Parts List

Item	Description	RS Part No.	Cost
R1	Resistor, 68 K ohms 1/2 W.	271-0011	$ .19
R2	Resistor, 150 ohms 1/2 W.	271-0013	.19
R3	Resistor, 10 K ohms Pot.	271-1715	1.09
C1	Capacitor, 1000 uF, 35 V.	272-1019	1.59
C2	Capacitor, .047 uF, 50 V.	272-0134	.49
C3	Capacitor, .001 uF, 500 V.	272-0126	.49
BR1	Bridge, 1.0 Amp, 50 PIV	276-1161	.89
U1	IC, LM-317-T, Adj. Reg.	276-1778	1.99
L1	RF Choke, 100 uHy.	273-0102	.99
J1,J2	Connector, F-61, Chassis Mnt.	278-0212	.99
T1	Transformer, 25.2 VCT.	273-1386	4.59
SW1	Switch, SPST, 3 A. 125 VAC	275-0645	1.99
FH	Fuse Holder, 125 VAC	270-0364	1.29
F1	Fuse, 0.5 A. 125 VAC	270-1271	.79
PL1	Pilot Lamp, Red, 125 VAC	272-0712	1.99
CD1	Cord, 18 Gauge, 125 VAC	278-1255	.99
M1	Meter, 0-1 Ma., Rm added.	UR-CHOICE	

WHAT IS A HOT-CARRIER DIODE?







A typical diode has a semiconductor junction formed by a P-type and N type material. A diode may also be formed by using a semiconductor or metal. Instead of a PN junction it may be referred to as a N-M or P-M junction. Development of the S-M diodes lagged behind PN junctions because of difficulty encountered in manufacturing. Silicon-metal diodes exhibit a voltage breakpoint of 0.2 volts, similar to germanium diodes which operate at 0.3 volts. The metal selection determines the break point.

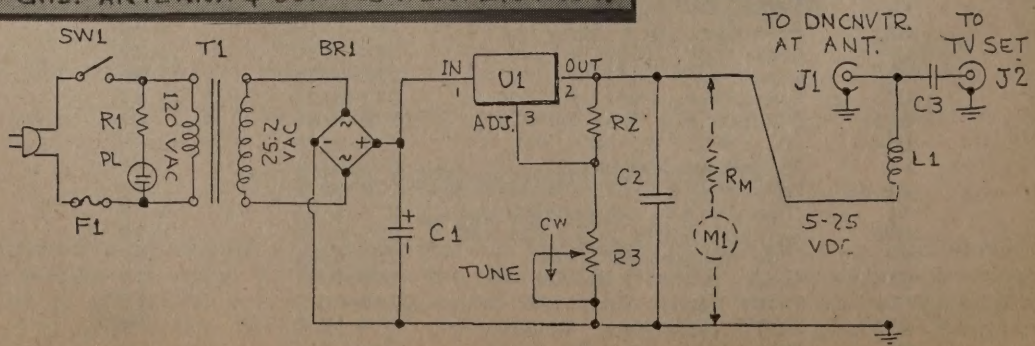
The N-M junction diode current is the transport of electrons, hence is a majority-carrier current. Electrons which ave crossed the junction into the metal are not distinguishable from the electrons which constitute the conduction electrons in the metal. When voltage across the junction is reversed the electrons are not able to return across the junction nor are the electrons of the metal.

The reverse recovery time of a very fast PN junction may be as low as 0.7 nanoseconds. The recovery time of a S-M diode is in the order of 0.05 nanoseconds an order of magnitude faster.

When a S-M diode is forward biased the electrons in crossing the junction to enter the metal, fall down a potential hill. Therefore initially, until these electrons come to equilibrium with the electrons of the metal the injected electrons have a higher energy and velocity.

The mean energy of the injected particles (molecules in a gas, electrons in metal, etc) is measured as a temperature. Thus the injected electrons are referred to as HOT electrons and the N-M diode is referred to as a hot-carrier diode. Because electrons have greater mobility, hot electron diodes are preferred over hot hole diodes. Hot carrier diodes are used in mixer circuits and provide better performance at UHF/microwave frequencies and lower signal levels.

The 1N34 and 1N82 are germanium diodes, not hot carrier diodes. As an example, an HP 5082-2835 is a hot carrier diode (HCD). The diode symbol used in schematic diagrams does not differentiate between signal and hot carrier diodes. Down converters using singly balanced or doubly balanced hybrid ring mixers utilize hot carrier diodes exclusively.



MORE NEWS

Dennis P Jurisinec, 11 Glengate St., North Geelong, Victoria 3215 Australia:

Firstly I must congratulate you on a very interesting magazine. I found the article on microwave FM ATV tx very interesting, and the helium balloon a novel application for ATV. Something I would like to try myself someday. The main reason for my writing was the article written by John Spaeth KD0LO on Commodore Amiga for SSTV. I have been using the Amiga computer with a genlock unit for quite some time now on ATV with great results. I had often heard that a SSTV system was in the books, as this computer if any is ideal. Therefore, I would be pleased if I could obtain further information as to where this Software/Hardware is available, and/or pass my name over to John for further correspondence.

Also recently I have built a 444 MHz ATV valve power amp for use with a Y-579A/667A or 2C39BA. The PA is very good in performance equaling that of a 100W solid state for a fraction of the cost, and it is very simple. But since I only have one valve and am having difficultly getting Y-579A I hope that you could perhaps point me in the direction of a source, or perhaps one of your readers may have some to spare even used would do, naturally expenses would be met.

I hope that this letter is not too much of a burden to you.

ALABAMA ATV

A meeting was called for all who were interested in ATV, in the Mobile, Alabama area. Showing were: N4UXY, Danny Carpenter W4DHG, Herb Stein N4RUC, Warren Locklin KA4FAV, Paul Lanier N4VBT, Kramer Robinson KC4IMC, Roy Kelley KC4JCL, David Durant Also wanting to attend, but unable to were: N4TTS, Don Barry, Tim Stringer.

The meeting was called by N4UXY Danny. N4RUC Warren had already sent video to W4DHG, Herb and vice versa. Also, Danny was able to receive both but not transmit at this time. Paul, KA4FAV, told about putting a video camera in a civil air patrol airplane and sending fabulous pictures of Mobile Bay to all. Herb stated that there was a strong interest in ATV in Pensacola area. He and Warren had sent and received video (but no audio) with Dave Summons, K4KIF; KA4PME, Chuck Dawson; WA4DDY, James Rowells; and W4EQR, Harvey Campbell at a 60 miles distance. It was decided we needed to work towards putting up a repeater in Foley, Alabama, which is halfway between the two cities, also decided to meet again in two weeks. It was announced that Mobile frequency was 439.250 and Pensacola, 434.00. Horizontal Polarization for Pensacola and Mobile at this time. For more info contact William L. Bowen 508 Dalton Road, Piedmont, S.C. 29673-9124

SOUTH CAROLINA

The ATV group had a table at Greenville, May 6-7 at the Hamfest. Thanks to Don, K4SAO, Fred WD4KTI and Edgar KC4CTW for the fine demo. We used tapes and live shots from the parking lot.

The tapes were made on a couple of trips to the Blue Ridge mountains, which are not far away from here. We hope to do more mountain topping later in the summer. Some weeks ago we had a band opening. A couple nights, MAYO W4YIU worked Phil N4HTY about 165 miles. Not bad for this part of the country. We will be looking for you.

ATV South Bay
Bob Reiling W6JHJ

ATV activity is on the increase in the South Bay with many amateur radio operators now regularly sending pictures to each other. The increased activity can be attributed to the television repeater now in operation south of Palo Alto on Black Mountain. This repeater began daily operation last summer and is sponsored by the Palo Alto Red Cross Chapter. Input to the repeater is on 426.25 MHz, 434.00 MHz, or 910.25 MHz. The Red Cross has sponsored the group buy of a 2.4 GHz receiving system that connects to your TV set. Each system includes a 20" parabolic antenna, associated down converter, power supply and 60 feet of RG-59 coaxial cable. This receiving package costs about $73 when purchased with the group buy plan. Usually groups of 50 are required in order to obtain this very reasonable price. About 200 receiving packages have been distributed so far.

The repeater is regularly in operation from 5 PM to 12 midnight. An information screen is transmitted when the repeater is not being used by ATV operators. Control operators are available to turn the repeater on at other times. The ATV two meter coordination frequency is 145.51 MHz simplex. In addition, control operators monitor the two meter 145.27 MHz repeater. ATV net is on Thursday night when the ATV net is run at 8:45 PM on 145.27 MHz for audio check-in as well as ATV check-in on the TV repeater. It isn't necessary to have ATV equipment to be a part of the net--everyone is invited who is interested in ATV.

Information: Location: Black Mountain/Output Frequency: 2.4 GHz/Input Frequency: 426.25, 434. 910.25 MHz/Repeater Call Sign: WA6CGX/-Technical Information Contact Telephone (408)241-3508.

WEATHER SATELLITE RECEPTION INFO
Dallas Remote Imaging Group BBS

A phone line BBS is available for those interested in Weather Satellite reception and remote imaging. The Weather FAX and Remote Imaging DATALINK BBS can be reached at (214) 394-7438 and is run by Jeff Wallach, N5ITU. Weather satellite pictures are on the system for the IBM-PC (GIF format: VGA graphics recommended for best quality) and are also available for the AMIGA. For those of you tracking these satellites, the Keplerian element sets can be obtained from the CELESTIAL RCP-/M BBS run by TS Kelso at (513) 427-0674 in Fairborn, Ohio.

The Dallas group is also offering a package for receiving APT weather satellite images using an AMIGA. Contact them at the following address for more info: Dallas Remote Imaging Group, P.O. Box 118053; Carrollton, TX 75011-8053. Phone 214 394-7325.

10 MW. BEACON TRANSMITTER FOR 2 METERS

Carl WA4ADG

This article describes a simple 2 transistor transmitter which can generate a pulsed cw signal of up to 10 mW output while operating from 6 Vdc @ 7 Ma. I originally designed this device in 1977 as an animal tracking transmitter for the Tenn. Wildlife Resources Agency while I was a student at Tenn. Tech. The original circuit operated in a VHF license free bio-telemetry band. With a few coil and crystal changes the circuit was easily placed in the 2 Mtr band. I have flown this transmitter several times in balloons and had phenomenal coverage, over 150 miles, from just 10 mW!

This transmitter is very simple to build and tune-up on 2 meters. It includes a variable osc. keyer which can generate many distinct pulse combinations, or you may key the transmitter with your favorite cw IDer design. Surplus crystals for this device are available at hamfests. I use 3rd overtone units in the area of 48 Mhz. that are used as VHF channel crystals for scanners. These scanners usually have a crystal formula such as rec. freq. +10.7/3 = crystal freq. Almost any 3rd overtone crystal in the correct freq. range will work in this device.

The osc. generates between 5 to 10 Mw. of RF at 48 Mhz. The output of the osc. then drives a simple diode tripler to generate 144 MHZ. The MPSH-10 transistor is used as a class c amp and also helps to clean up the final RF output. The closest spurs at 96 and 192 MHZ. are at least 40 DB down. B+ to the transmitter is controlled by a 2N2222 transistor which is keyed by the free running osc. made from a 74C00 digital ic. This ic is arranged as two separate osc. "ANDED" together. One osc. is a "slow osc." that is 1 Hz, or slower and the other osc. is a "fast osc." at 5 Hz. or greater. By varying the RC values of each osc. an infinite variety of modulation signals can be created, which is an easy method of telling one deer form another, or one balloon from another! If you wish to use a CW ider, simply feed the digital output thru a 10K resistor into the base of the 2N2222.

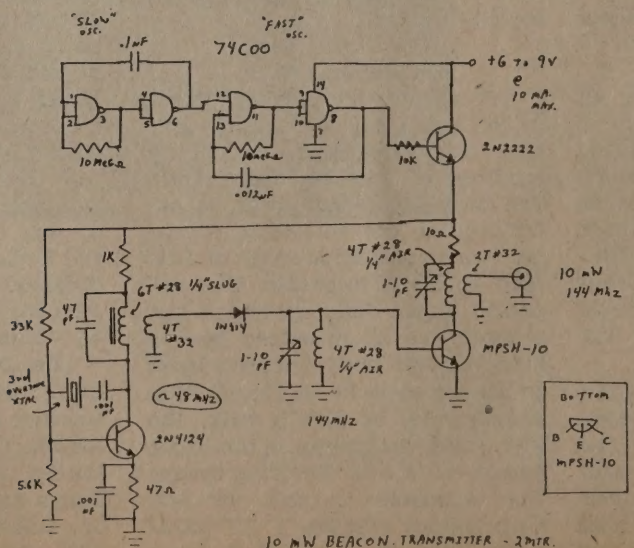
TUNE UP

Build the transmitter one stage at a time. Start with the osc. Apply +6 vdc. to the osc. If it is running you should be able to hear the 2ND. harmonic on a stereo set for 96 Mhz. If the osc. fails to start, try varying the LC values of the tank a bit. If all else fails, try increasing the 5.6 k resistor or decreasing the 1 k resistor.

Once the osc. is functional build the tripler and amp, A small dummy load should be placed on the output link of the amp. Adjust the input and output caps fo the amp. for max. RF out. A grid dipper or spectrum analyzer would help at this point. Without test equipment you might try adjusting the caps for mx. deflection of 2 M receiver's S-meter. Do not attempt to extract more than 10 mW. of power from the unit, the MPSH-10 and the F.C.C. won't appreciate it. The spectral purity goes south when you overdrive the class c amp. After the transmitter is operational, build and connect the modulator with the 2N2222 keying transistor. Adjust the slug in the osc. for best chirp free keying from the transmitter as heard on a 2M sideband about .5Ma while off and a maximum of 15 Ma. while keyed.

With a keying rate of .1 seconds every 10 seconds a set of good "AA" batteries will have a lifetime of several months. (ED.NOTE: 6 volt lightweight Lithium battery modules are now available through most photo stores and should work well with this circuit.) You are now ready for launch!

PS: The output of this transmitter can be monitored by FM rigs with the squelch open, so be sure to include your repeater only, 2M friends, in on the fun!.
73'S - Carl, WA4ADG



ON THE ROAD WITH THE ELK
(The Return Home) Bill, WB8ELK
NORTHERN CALIFORNIA

Before leaving California, a trip was made to scout out the Northern California ATV activity. I paid a visit to the Monterey ATV group and met with the group at the Naval Post-Graduate School radio club. Doug McKinney KC3RL has been assembling an ATV repeater at the club with an output on 421.25 Mhz. The final input frequency is undetermined at this time but was on 434 Mhz for testing during my visit. Greeting me at the clubhouse were Doug KC3RL, Beverly KC6AMI, Elliot KB3LY, Pat AA6EG, Don KB6BZL, and Rocky KB6DNE. The meeting was sent out via the repeater so that those at home could watch. The repeater covers the Monterey-/Carmel area on up to Santa Cruz. Most simplex ATV activity occurs on 426.25 or 427.25 Mhz and is horizontally polarized. This allows many people to watch via their cable ready TV sets or VCRs on cable channel 58. They have an ATV net every Tues. nite at 8pm and meet on 144.34 Mhz. After the meeting, I was able to work KB3LY mobile until I crested the mountain north of Santa Cruz nearly 45 miles away. Contact Doug McKinney KC3RL, 9 Glenn Ave. Salinas, CA 93907 415 663-6117 for more info.

Entering the San Jose area in the heart of Silicon Valley I came across a very unique ATV repeater. This WA6CGX ATV Repeater is located on top of Black Mountain above Palo Alto and has a primary output frequency on the 2.4 Ghz band! The input frequency can be either 426.25 Mhz, 434 Mhz or 910.25 Mhz horizontally polarized. The input frequency is changed with a control command and can be linked up to the Mt. Diablo ATV repeater to the north on 427.25 Mhz. Members of the San Jose group all use small MDS downconverters with 20" dishes for 2.4 Ghz receive. These downconverters are usually fairly inexpensive and seem to be showing up in the surplus market. This repeater works well and I had a lot of fun sending back pictures of the Golden Gate bridge from the Berkeley hills nearly 65 mi away from my mobile rig. The repeater operates from 5 PM to midnight every night. There is an ATV net every Thurs. night at 8:45 PM on the 145.27 Mhz repeater as well as video checkins on the ATV machine. The ATV calling frequency is 145.51 Mhz as well as the 145.-27 repeater. During my stay I was able to drop by for an enjoyable visit with the group. Active ATV-'ers in the area are Eric (N6OIM), Leroy WA6DIO, Bob W6WFH, Bud KE6DN, Bob W6JFJ, Bob KB6FEC, Rich WB6KEQ, Rich WB5VUL and Clay K6AEP.

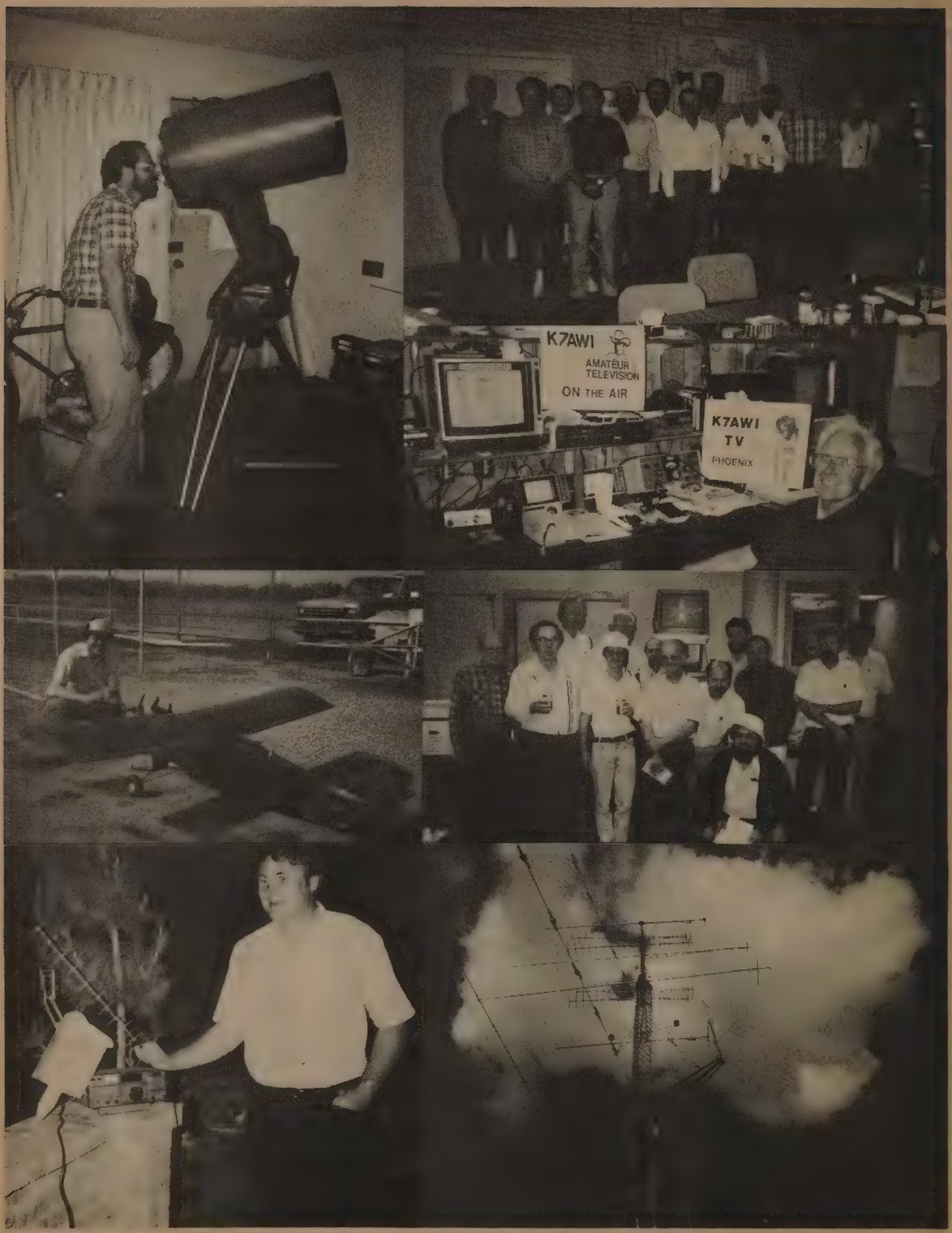
Further to the north there is the the W6NKF ATV repeater on top of Mt. Diablo. More land surface area can be viewed from the top of this mountain than just about anyplace in the U.S. This repeater covers the Contra Costa valley, part of the Bay Area including San Francisco, and a major portion of the Central Valley including Sacramento. The furthest station able to hit the repeater is W6VZG in Pine Grove, who puts in a P5 signal from over 85 miles away. Input frequency is 1264 Mhz and the outputs are 427.25 Mhz and 2440.25 Mhz. The calling frequency is on 223.74 Mhz W6CX repeater and also on the 147.06 repeater. I had a chance to watch N6DTU coming through the repeater while driving over to meet with Don W6NKF, Mike N6GOZ and KB6FEJ in Concord. The 427.25 Mhz output is easily viewed on home cable ready sets and has generated quite a bit of interest in ATV. Also they have regularly been active in Space Shuttle retransmissions during each mission.

Returning to Santa Barbara, Rod WB9KMO and I decided to go on one last mountain-topping DX-pedition. Rod has turned his 1960 Mercedes into a mountain top classic. Replacing the sunroof with a board with a 10 foot mast protruding through, he has mounted some of the most amazing mobile antennas you're likely to see. On a crossarm he has mounted a K2RIW 434 Mhz beam, a F9FT 900 Mhz and a 1200 Mhz beam. To top this off he has a 6 element 2 mtr antenna. Inside he has a rotor bearing and can steer the whole array once at the final site. Some of these antennas are as long as the car! It's quite a site to see this arrangement driving down the streets of Santa Barbara (gets quite a few open-mouthed stares). (Ed comment: and some of you thought my 20 el cp yagi was dumb! KB9FO) Fortunately, the state patrol hasn't gotten a good look at it yet. Once on top of the 3000' Romero Saddle we had a chance to work some real DX. Mountains can either help you or hurt you on ATV and this time they worked phenomenally for us. P4 to P5 signals were sent and received from stations in LA over 125 miles away. The Santiago repeater was P4 on 1253 Mhz as well as the Mt. Wilson machine on 1241 Mhz. The San Diego repeater on 1277.25 Mhz was seen P3 over 220 miles away. Kinda nice to create your own band openings!

Leaving Santa Barbara, I began my journey east and visited the LA ATV group one last time. Visiting JPL headquarters is always a treat with a guided tour this time from Jan WB6VRN and Greg WA6JAD. During August the Neptune close encounter will be sent out from JPL over the repeaters in the LA area. I then visited the headquarters of P.C. Electronics where I visited Tom and Maryanne and got to see the latest goodies being developed. On to the mountain top retreat of Mike WA6SVT. Living at the 5000 foot level in Crestline, Mike enjoys mountain-top activities each and every day with a line-of-sight view of 100 miles. He put all those huge spruce trees to good use and actually mounted his antennas on top of a 100 foot tree!

PHOENIX

Arriving back in Phoenix, I was again greeted with tons of ATV activity. I had a chance to visit with Earl KS8J and meet with dozens of the group during their ATV NET. They are working on placing the ATV repeater on 2000' South Mountain with coverage over


K7AWI
AMATEUR
TELEVISION
ON THE AIR
K7AWI
TV
PHOENIX

most of the greater Phoenix area.

TUCSON

Once again Roy (N4ABY) is looking for ATV contacts. He now has a 14" mammoth telescope (quite a zoom lens!) and has taken some remarkable images of Mars with his sensitive CCD camera and frame grabber board for the IBM-PC.

EL PASO, TEXAS

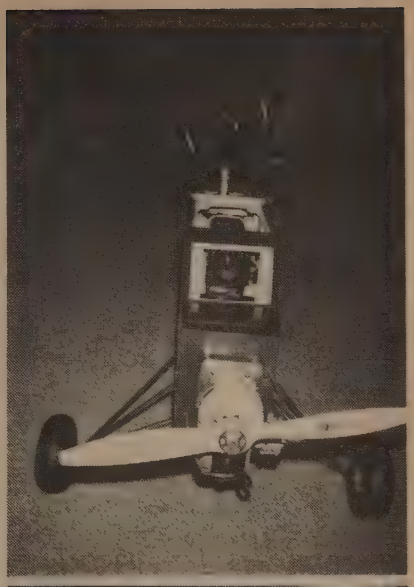
I found one ATV'er near EL PASO. Reiner DC3OQ/W5 has been active in ATV for years but so far mostly has people watching the Space Shuttle video he transmits during the missions. One of Reiner favorite hobbies is tracking the weather bureau radiosonde tranmitters. These are launched every day in the late afternoon and transmit on 1680 Mhz. Reiner and friends grab their R-7000 rcvrs and small 11 element beams and head out for the ultimate Fox Hunt. They've recovered quite a few of these so far and his eventual goal is to actually catch one before it hits! He missed the last one by only 100 feet. If he'd stayed with his car he would've had it! For more info on EL PASO activity contact Reiner Junge, 5719 Weatherford - EL PASO, TX 79924.

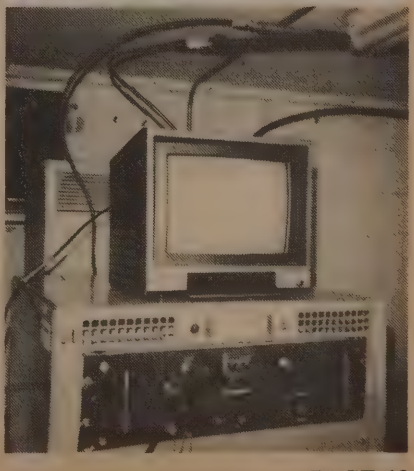
ABILENE

My car began to die out in West Texas. Driving through west Texas at 50 mph is kind of like those nightmares where you're trying to run through molasses! After an exhausting drive, I finally reached the QTH of Carl K5MWN. Carl is putting together their ATV repeater which will have an input on 439.25 Mhz and output on 421.25 Mhz vertically polarized. There also will be a weather radar link on 923.25 Mhz. The repeater is located 10 miles south of Abilene 700 feet above the surrounding terrain. The two meter calling frequency is 144.34 Mhz or the 146.76 repeater. Some of the other active ATV'ers are WB5ZOO, KD5CDS and WB5VIH. Carl has a unique quarter scale R/C airplane with a Kreepie Peepie ATV transmitter and a color camera. This is mounted in the cockpit of a Robin Hood 99 by World Engine. The plane is powered by a Zenoah 380cc (2.6 Cu. In.) gasoline 2 stroke engine. We went out to the Abilene R/C flying club to take her on the maiden flight. The flying park is a miniature airport with an asphalt runway with markings and a taxiway! This plane flies perfectly and the camera position gave us the feeling that we were in the plane going along for the ride. Carl can actually fly this plane just by viewing his TV set and doesn't have to look at the model in flight. Recently he took this setup to the quarter scale nationals and modified a SEGA Turbo Race Car arcade game to function as a cockpit. He mounted an ATV receiver inside and gave everyone a chance to sit behind the controls and fly along! He eventually plans to have a working control panel in the cockpit monitoring the telemetry from the plane to provide him with a full flight control center! Those desiring further information about the plane or Abilene activity should contact Carl Berry K5MWN, # 25 Cambridge Ct., Abilene, TX 79603 or call 915 672-1319.

DALLAS

Driving through during rush hour I encountered quite a bit of activity. I was able to talk to W5OYS in Boyd, TX who runs a repeater on the west side of Ft. Worth. It has a 439.25 horizontal input and outputs on 923.25 vertical. Next I was herded in from the freeway by Andy WY5V and April N5LLF who let me work a number of the locals from their station. The calling frequency is on 144.34 Mhz in the area. Next down the road I visited Mel W5EEY in Terrell. Mel operates a split site repeater with an input on 426.25 Mhz and output on 923.25 Mhz at his house. 8 miles down the road there is a repeater with a 923.25 Mhz input and output on 434 Mhz. In this way he can link up the WD5FYD weather radar signal from Garland which transmits from 900' on 426.25 Mhz. Mel also has a camera on a weather station console which shows dials for wind speed, temperature and humidity. Included in this lot is a live weather radar which is





generated from a marine radar unit on his barn roof!

TYLER/KILGORE

Texas hospitality is no myth and they definitely do things in a big way! My arrival in Tyler was no exception. I had the pleasure to meet with the Tyler/Kilgore ATV group and was greeted with quite a turnout. Lots of active ATV'ers exist in this area with two ATV repeaters active. The W5KPZ repeater is located near Tyler with an input on 434 Mhz and outputs on 421.25 Mhz. This is a very sensitive repeater with little or no desense. Dave Baxter W5KPZ has been one of the pioneers in ATV and did his best to put up a quality repeater. The Tyler ATV group monitors the 146.96 repeater for their talk frequency. Active ATV'ers present at the meeting were Dave W5KPZ, Bob W5RHP, Ida Fix, Jack WA5TMU, James K5JF, Mel W5KJB, Tom K5BNS, Johnnie WA5EST, Eric KA5YYW, Arlyn AA5-BY, Leo W5EKO, Kasem W5FGT and Charles WB5UIZ. In Kilgore the K5KFC repeater has an input on 439.25 Mhz and outputs on 426.25 Mhz. They monitor the 146.92 repeater.

While in the area I visited the NSBF (National Scientific Balloon Facility) in Palestine, TX to see how the big boys launch balloons! These fellows launch payloads as big as a van to over 140,000 feet several times a year. The balloons stand 500 feet tall before launch and payloads can reach over 3000 lbs. Apparently, it's easy to track the balloon flight path by the UFO reports that come in.

MEMPHIS, TN

As I was travelling through Memphis, I was able to make a few mobile contacts with KA5BFC in West Memphis (enjoyed the eye-ball QSO in Dayton) and with Dale (K0JXI) in the southern part of the city.

NASHVILLE, TN

Serious doubts that I would make the Dayton Hamvention due to the increased problems with my car. I was getting about 300 miles per gallon of OIL!! I alerted Bob KJ4ZQ about my problems and was unable to arrive at a decent hour. Bob is building an ATV repeater in Nashville with 439.25 Mhz input and 421.25 Mhz output horizontally polarized. The two meter talk frequency is via the 146.67 repeater. As I got closer to Nashville in the wee hours of the morning, I heard the 146.67 machine come in full quieting giving out it's automatic I.D. I keyed up the machine and got back the following computer voice greeting: It said "Welcome WB8ELK, Watch your OIL pressure!". This message was repeated every half hour throughout the night until I reached the motel. Upon waking up that morning, I turned on the 2 m rig and guess what was still being repeated every so often!! I guess all of TN knows about my car now.

LOUISVILLE, KY

I was able to at least chat on 2 m with one of the two active ATV'ers in the area. When in Louisville contact W4PQU or Keith WD4SEA.

CINCINNATI, OH

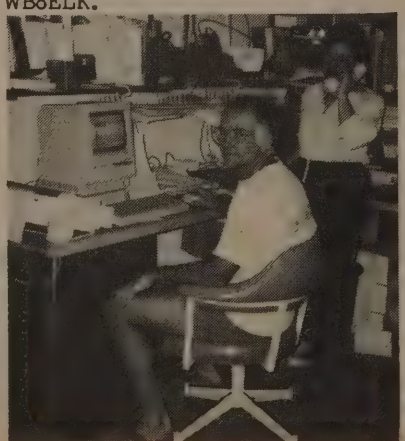
Coming around the north side of Cincy I was able to work a 2 way ATV mobile contact with Tom WA8ZAH, Ron NR8O and Rick KA8VHR. Almost home!

DAYTON, OH

I MADE IT AT LAST!!!

Just in time to meet John KD0LO and Dave WB0ZJP as they arrived from St. Louis and do a two way mobile to mobile contact while driving down the freeway! Timing this perfectly, Henry KB9FO and Mike WA6SVT arrived on the scene at the same time from Chicago.

Future On the Road expeditions will take us to parts of the East Coast this summer. 73's - Bill, WB8ELK.



York/ATVQ Technical Session

Presented by the Keystone VHF Club of York, PA. and the Amateur Television Quarterly (ATVQ) Magazine

This is to be held in addition to the York Hamfest which takes place on 23-24 September, 1989

Saturday night 23 Sept 89 at Wynn's Homestead Restaurant

Located on PA Route 74, 3720 Carlisle Road in Dover, PA.

Times: 1800-2215
1800: Banquet at the Homestead Family Restaurant
1930: ATV Technical Session hosted by CAPTAIN Video, Henry Ruh, KB9FO
2130: Live ATV Demo by local stations in full color

Special Friday night, 22 Sept 89 Informal session at a place to be identified. 1900-?? Talk in on 146.97 repeater on 22 and 23 Sept 89.

Banquet cost: $10.00 per person, spouses are cordially invited

Snacks, coffee, soft drinks available compliments ATVQ while they last. Thereafter, courtesy your funds.

All Homebrewers are encouraged to bring and display Homebrew ATV equipment. Prizes: ATVQ Subscription and certificate suitable for framing.

For additional information, write John Shaffer, W3SST, 2596 Church Road, York, PA. 17404 or call (717) 764-4805

MORE HIGH FLYING ATV

1989 should be a busy year for high flying ATV activity. Already three helium balloon flights have been launched with more scheduled this summer.

On April 15, ORION radio club members in Knoxville, Tennessee put together a rather unusual balloon system. Over 60 small helium party balloons were provided by the Student's Museum after a China Festival. These were all bunched together to provide about 380 grams of lift. A low-power (10 mW) two meter beacon transmitter was built by Carl Lyster WA4ADG and placed into a small plastic egg-shaped container. This circuit is described in detail elsewhere in this issue. The total package weight including the 9 volt battery was 84 grams (3 oz).

ORION members Carl Lyster WA4ADG, David Fields N4HBO, Richard Sears KC4IBC, Scott Fields and Jennifer Lyster launched the balloon at 2043 hours EST. This flight was designed to provide practice in launching, tracking and coordinating observations. Over 30 amateurs tracked the balloon from Tennessee, N.C. and S.C. and reported their bearing and elevation readings by radio to net control over a 3 hour period. The package drifted to the east/southeast and was either lost when shielded by mountains or descended to earth. An attempt was made by David Fields and Bob Lenc to locate the transmitter using a light plane but nothing was heard from it. The farthest reception was to K4SAO in Spartanburg, S.C. (150 miles). Carl WA4ADG and David N4HBO plan on launching another balloon July 22th early in the morning with a two meter FM transmitter on 144.34 Mhz and a 10 mtr CW signal on 28.866 Mhz. The telemetry will be about a one minute digitized voice message commemorating the 20th Anniversery of the Moon Landing along with a SSTV picture and Packet message.

Just two weeks later on April 29 at 7:30am, another balloon was launched by the Pearland, Texas group. This was a 10 foot monster with over a 12 pound payload! Jim KV5G and Tom WB5UXF built up a 10 watt ATV transmitter with a P.C. Electronics TXA5-5, 10 watt power module and a B/W vidicon TV camera. This was all mounted into a styrofoam cooler with the camera pointed out the bottom and a "beachball" omni-horizontal antenna on the top. Over 5 pounds of NICADS were used for power (Lithium cells will be used on the next flight to reduce weight). A large parachute was contructed using a bedsheet complete with a floral pattern! The balloon was inflated with nearly 500 cu. ft. of helium to reach a very large 10 feet in diameter! Even with the payload attached the balloon had 20 pounds of lift. When released everything shot up just like a rocket towards the cloud layer above.

A great view of the area was seen snow-free until the package flew into the clouds after 5 minutes. The cloud tops could be seen for a few minutes then the balloon burst! The balloon used for this flight was not designed to expand much beyond 10 feet so the package made it to about 10,000 or 20,000 feet before parachuting back (future flights will use a weather balloon capable of 100,000 feet). At the highest altitude the signal was received by several stations as far away as Austin (150 miles). The package was very stable throughout the flight and very little spinning was observed. The bed sheet parachute worked very well and gently brought everything back to earth. The houses of the neighborhood could be seen getting closer. The package drifted over a cow pasture where it made it's landing. The final moments of video show the ground rushing up in a spectacular crash looking much like one of the Ranger moon landings! Jim and Tom looked over the local roadmaps and finally found the area they saw on the live video and located the package a few hours later in a field 2.5 miles away. Unfortunately, when they arrived they discovered that the farmer who saw the landing thought it was a bomb and plugged the package full of lead from his 22 rifle! The package had several bullet holes in it and one of the shots made a direct hit on the camera vidicon tube! The next package will have a very large REWARD sign and a big old American FLAG on it! Another flight is planned in the future with a lighter payload and a larger balloon.

--SCHEDULE of UPCOMING BALLOON FLIGHTS--

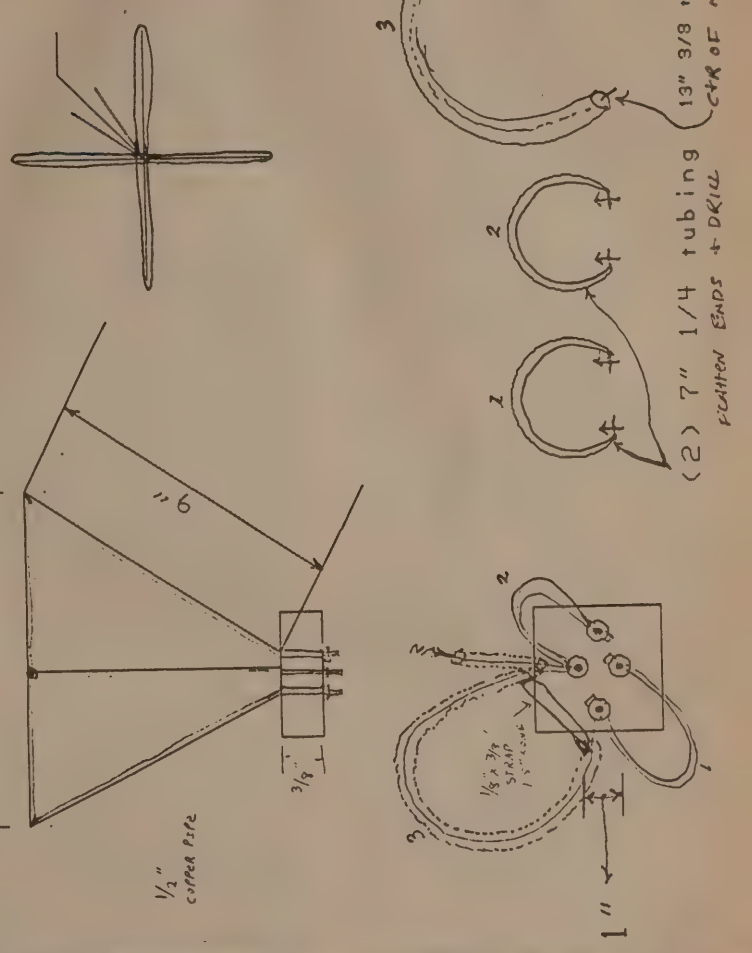
* July 22nd, 8am - WA4ADG/N4HBO - 144.34 Mhz FM (digital voice ID & SSTV), 28.636 Mhz C.W. ID, HF net on 7.155 Mhz - Knoxville, TN - celebrating 20th Moon Landing. Info: Carl Lyster (WA4ADG), 4412 Damas Rd.- Knoxville, TN 37921
* July 22nd, 11am - N8IYD/WB8ELK - 144.34 Mhz FM I.D., 439.25 Mhz ATV w/ live camera and on-screen telemetry, HF net on 7.155 Mhz - Armstrong Air & Space Museum, Wapakoneta, OH - celebrating 20th Moon landing. Info: Bill Brown (WB8ELK), 12536 T.R. 77 - Findlay, OH 45840
* Late Summer/Early Fall - KA9SZX/WB8ELK - 144.34 Mhz FM I.D., 439.29 Mhz ATV w/ live camera, 7.155 HF net. - Champaign, Illinois.
* August/early Fall - KE9S - 2 mtr and ATV balloon - Colorado Springs, COLO. Info: Malcolm Benton (KE9S), 15365 Deby Dr. - Colorado Springs, CO 90921-2280.
* To be Announced - WB5UXF/KV5G - 439.25 Mhz ATV 10 watts - Pearland, Texas (Houston area). Contact: Jim Warta (KV5G), Rt. 4 - Box 4745 - Pearland, TX 77581 - (713) 997-1451.

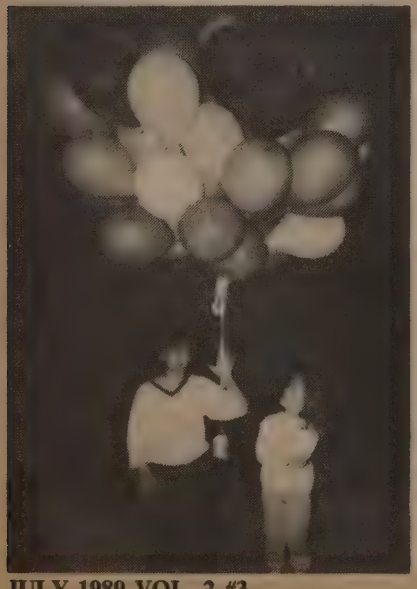
For further updates and changes check into the weekly HF ATV NET on 3.871 Mhz every Tuesday nite from 8pm EDT till 10 pm.

THE OMNI-OMNI ANTENNA
(Omnidirectional - Omnipolarity)

Lowell MMorton (WA7MXN)

In the Boise, Idaho area we have groups of ATV'ers running both horizontal or vertical polarization. Our ATV repeater will have an initial input on 1289.25 Mhz and an output on 421.25 Mhz. We decided to have an output which can be seen regardless of the polarization of the various groups so the Omni-Omni antenna was designed. This antenna consists of a pair of delta loops which radiate horizontally off the top pair and vertically off the upright part of the loops. Total gain in either plane is less than a single polarity antenna but can be made up with increased power to the antenna. The two loops are shorted at the top and the feedline attached as indicated in the drawings. This antenna was constructed with 1/2" copper pipe and mounted on a 3/8" block of plastic. Threaded bolts were inserted in the ends of the pipe so that the phasing and matching loops could be attached. The matching arrangement is made of two 7" pieces of 1/4" tubing and a 13" piece of RG-11/u coax. A shorting strap is placed between the two ends of the RG-11/u coax and soldered onto the shield for the best match. For more info contact: Lowell A. Morton WA7MXN, 6911 Northview, Boise, ID 83704.





REPEATER DESENSE DETECTION AND CURE

Dave Baxter — W5KPZ

Probably every Amateur has experienced desense to some extent whether they have either built a Repeater or just operated on the 2 meter band for some time.

Desense can cause many different problems, but the most noticeable and the one we can't tolerate is the one that literally destroys the sensitivity of our receivers. This happens when RF energy from our transmitter gets into our receiver and saturates the RF amplifier to such an extent that only very strong signals can get in.

My first experience with desense came when I built a 2 meter repeater in 1966. (1) I used several tricks to conquer the problem and learned that there is a great difference between transmitting RF and repeating RF.

The problems with repeating video are greater than FM partly because of the band width involved and the fact that we are used to seeing good video on our TV screens.

Basically, there are three problem areas where desense is caused:

1) The receiver-transmitter package and power supply. (R-T unit)

2) The filters and cables from the R-T unit to the antenna.

3) The duplexer and the antenna (or antennas).

The R-T Unit--RECEIVER:

Let's first determine if we have a problem and if we do, where is it? First terminate the antenna input by placing a 50 OHM resistive load on the receiver input. If you don't have an RF tight termination, make one by soldering a 2 watt 50 OHM resistor into a coax connector and close the end with solder or a piece of copper. Place it on the receiver and wrap it with aluminum foil. If you can't find 50 OHM resistors, a 47 OHM will work and by sawing it with a hack saw, you can bring it up to 50 OHM's.

Turn on the receiver with the transmitter off and connect a video monitor so that you can look at the received signal. You will see noise or snow.

Place an RF tight load on the R-T transmitter (one of the ten watt dummy loads is fine for this) and wrap it with foil.

By using foil we can prevent leakage from the connectors. (You should use Type "N" connectors for your RF)

Now while watching the monitor, turn on the R-T transmitter. Did the snow become lighter or darker in color, is there less or more noise, did you see a flash or lines come on whether they disappeared or not, did the "S" meter change from its previous reading?

If you answer yes to any of these questions, there is desense. If not, you can feel that you have an RF tight receiver and skip to the transmitter test. If we answered yes, let's determine how it got there and more importantly, let's cure it.

FIRST--I assume that you have an Rf tight enclosure for the transmitter and receiver. This is a must.

Plug all holes and attach it to your chassis with at least four screws as we can't have ground loops.

We need a source of RF on our receive frequency to use as a test signal. This can be an AM signal generator or your ATV transmitter. Tune the RF source to the receive frequency, if you modulate it with 400 Hz you'll get horizontal black bars across the screen (or place a pick-up loop inside your ATV transmitter). Make up a probe to come from your test source (see Figure 3A) by using a piece of coax and a 20 pf capacitor. We are going to use this probe as a "sniffer" to determine where the RF gets into the receiver.

Turn on the signal source and watch the monitor as you move the Sniffer probe around the receiver (transmitter off). Touch the power lead and all leads leaving the receiver enclosure while watching the monitor. You should see the signal source on the monitor if it is getting in on these leads. You may have to increase the level of the signal to see it clear, but if you see it at all when touching the leads, additional filtering is needed. Now place the probe around the video coax outputs. Do you see an indication of the signal on the monitor. Keep waving the probe and touching until you find where the leak is.

TRANSMITTER:

Attach the probe that you used on the receiver to your base receiver (not repeater) and tune to the Repeater transmitter frequency. While watching your base receiver, turn on the repeater transmitter. The strength of the signal that you have is an indication of how much RF is escaping from your repeater transmitter. You can use the probe to see where it is the strongest. I doubt if it will be perfect, but you should be able to get it down to a P1 or no worse than a P2.

POWER SUPPLY:

If you are using separate power supplies for the receiver and the transmitter you may have eliminated the common source of coupling, via the power plug. You can, however, use one supply if you use adequate de-coupling methods.

Bring the AC into the R-T power supply through an AC line filter. They are cheap, Mendelson's were selling them for $2 at Dayton and they had hundreds of them. Others have them as they are used extensively in computers.

The Cure: Figure 1 shows how we have wired circuits in the past.

A. Running a wire through a hole in the enclosure.

B. Using shielded wire bypassed at each end.

C. using a feed-thru bypass capacitor.

D. Using a combination of the above.

Figure 2 shows two ways of running the video and audio lines. A) attaching the shield and conductor at the PC board and soldering the two to the connector where it passes thru the enclosure. B. Attaching as above but using a bulk-

head connector. While the 500 or 1000 pf feed thru capacitors are effective for most applications, they fall short if you need total filtering as we do here. Attach a small metal box to the receiver or transmitter enclosure as shown in Figure 4 and add the partitions so that you have multiple compartments with feed thru caps, the only way through them. Add the chokes as shown. The small 33 uf chokes can be used for the meter and low-power circuits. For the transmitter power, wind 6 turns of #14 copper wire for inductors.

Under the last feed thru capacitor place a solder lug so that you can attach the braid of the shielded wire attaching the braid as above. In the Tyler ATV Repeater only four leads are thru the RF tight enclosure, power, meter, video in and monitor video from the transmitter.

The video leads should be attached to the PC board and a 100 pf capacitor installed from the center conductor to ground. The coax should have a connector on the end so as to mate with a bulk head coax feed thru connector going through the enclosure. Don't break the shield integrity by using a lug and reattach solder connection.

If you do you will need to add another by-pass capacitor for RF filtering. Remember that the additional by-pass capacitors will hurt your high frequency response. The loss of high frequency response will hurt color and audio, so don't do it. Get some feed thru coax connectors. (I saw lots of them at Dayton for a buck each.) I bring the two video coax leads out of my receiver and connect them to another enclosure where I house the video identifier (VDG-1) and the VOR. I connect them in such a way so that an incoming received signal will be passed to the transmitter.

When the received signal goes off the ID will feed my call letters via the VDG-1 to the transmitter for 40 seconds before turning off.

Should another received signal come in at any time, it will turn off the ID and be repeated as normal. This allows a station to use the repeater signal for test purposes by just keying it up and lets something other than noise be transmitted between QSO's. You can see that desense must be eliminated if the transmitter is allowed to transmit the ID without getting into the receiver. The second video lead goes to the VOR and is brought out to the front panel as a means of monitoring the received video.

The metal box that encloses the ID and VOR has all leads fed through 1000 pf feed thru capacitors. This seems to be adequate since no RF is involved. I don't use any additional 100 pf by-passes on the video lines in this box as the sniffer did not show that they were needed. Do not use any more bypassing on the video lines than is necessary as high frequency response will deteriorate rapidly.

In severe cases it may be necessary to use a video pass filter. The sniffer showed that a video filter was not needed here. The basic R-T unit here is a 10 watt PC electronics with a DM-1 demod board. After aligning the transmitter board as directed in the instructions, I noticed a slight roll off in response starting at 3 MHz. (Not real bad, but there.) I fed a Multiburst in and by a slight adjustment of C6 and C7, I was passing 4.2 MHz at the same level as the other frequencies.

I recommend that the exciter be aligned by feeding a multiburst at Video in, and adjusting C6 and C7 as a slight adjustment helps the harmonic attenuation as well as the band pass.

If you filter as shown you should see a noticeable improvement when you use the sniffer. I was able to key the exciter transmitter without any indication on the receive monitor.

FILTERS and COAX CABLES: Equally important is the RF lines between the R-T unit and the antenna. I use three inter-digital filters. One filter is between the exciter and the power amplifier. This filter is wrapped in aluminum

Figure 1

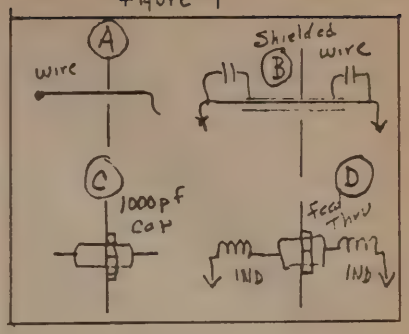


FIGURE 2

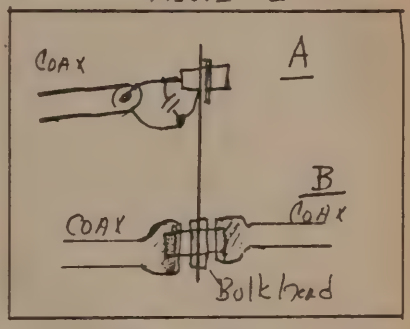


Figure 3

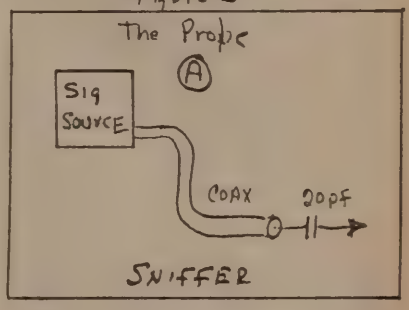
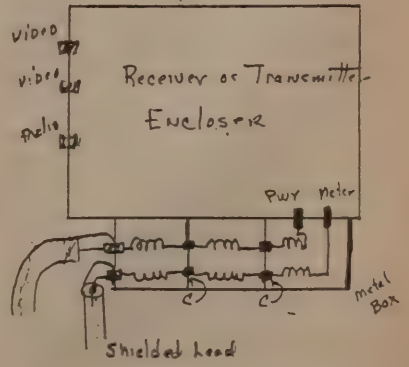


Figure 4



All Capacitors 500 or 1000 pf feed thru

See Text for INDuctors

6 Turns of #14 1/4" dia or 33 uf inductors

foil and is enclosed in a metal box with the coax leads going thru bulkhead connectors. Use a good grade of double shielded coax for these leads. Test the integrity of these cables by wrapping a 4" wide piece of foil around the cable and sliding it along the lines while watching the receive monitor. Any change in noise or signal level indicates a possible RF leak. The output of this filter goes to the D-1010 Mirage Amp.

THE AMPLIFIER:

The D-1010 Amp is an excellent device for amplifying video. And, by following the recommendations, it should give good results. However, there is one thing that gave me a problem in fighting desense. The manufacture has brought the power leads (plus and ground) out thru the shielded enclosure through two rubber grommets, and they have placed a seal on the enclosure. Using the sniffer, I detected considerable RF on both leads even though they were by-passed at the board and have toroid coil filters on the leads. Not wanting to break the seal, I placed a metal shelf between the amp and my R-T unit and slid shielded braid up as far as possible so as to touch the enclosure.

I by-passed these power leads at the 30 amp power supply. (I run a separate supply on the amplifier). This cured my desense enough so that there is no detectable change in the receiver meter when the repeater keys. I spoke with Mirage at Dayton and they were very concerned and told me that they will look into this.
I believe that it could be corrected if they came from the PC board with an inductor to a feed through filter that passes through the enclosure. I have learned that wires thru grommets are not effective at this frequency and even ground wires of only a few inches in length can radiate RF.

The receiver uses two filters with a pre-amp located between them. These were necessary because we share a site which has 5 commercial 450 MHz transmitters on the two are in close proximity to us. With one filter, we noticed when they would key and had some intermod from them. The W5KPZ repeater in Tyler is passing excellent Color signals but the intermod and desense had to be licked before we got it to this point. I believe that the above techniques will allow your repeater to do the same. (Two Meter Repeater - 73 magazine, September 1966, page 58)

MINIATURE TV CAMERAS

Bill, WB8ELK

I've had numerous requests for information and availability of small TV cameras for use in R/C aircraft, balloons and mounting on towers. Here is a description of a few likely candidates depending on your use and the size of your wallet!

Browsing through the Fordham catalog 800 645-9518 or 800 832-1446 in NY, I found two nice examples made by SONY. The model CCD-G1S is a very small color CCD with auto-iris for $749 and appears to be the same model number as the consumer version I saw at the CES show. The B/W saticon camera model HVM-322-BNC is a similar camera that was used in the live camera balloon launch in California. This has a BNC connector for video and RCA jack for audio and sells for $379. While at the CES show, I took a close look at the GBC 500 B/W CCD camera. This camera uses the Philipps Amperex module mentioned in the April issue of ATVQ. This is a very high quality, high resolution and extremely low light camera. It has been used quite successfully with telescopes to produce some amazing results for those interested in astronomy. One lighted match is enough to fully illuminate a room. It's sensitivity to the IR spectrum allows you to actually see the hot tip of a soldering iron. This is the closest thing you can buy to a night-scope as a moonlit night will light things up like broad daylight. Call GBC at 800 221-2240 and ask for Gary Perlin. Tell him you saw it in ATVQ for the special price of $459.50 (minus lens). It's a C-mount so any lens will do it...this

½" SATICON" MONOCHROME (B&W) VIDEO CAMERA
MODEL HVM-322-BNC OUR PRICE $379.95 With Lens NEW!
• High sensitivity quick start ½"
Saticon" pickup tube (min illum 5 lux)
• Compact lightweight design
• Built-in auto-iris lens (11mm f1.8)
• Automatic gain and beam blanking
• Built-in electret condenser microphone
• Video output connector BNC-type
• Audio output connector RCA-type
• Sync System: Internal
• Scanning Frequency: 15.734KHz horizontal 59.94Hz vertical • Output: Standard BNC
• Video: 1Vp-p 75Ω sync neg • Audio: 5dBs (436 mV rms) less than 10 kΩ
• Power: $11.15V DC, 8V DC normal • Power Consumption: 0.8W when the auto-iris is open.
• Size: 2"W x 1¾"H x 5½"D • Weight: 7.6 oz
• Supplied Accessories: WU-441 clip mount camera holder
Optional Accessories
VCL-04HS Wide Angle Attachment Lens (75°) $64.00
VCL-04HS Wide Angle Attachment Lens (103°) $69.00
AC-40A AC Power Adaptor 700MA $30.00
AC-04L AC Power Adaptor 600MA $21.00
AP-11B Switcher/Remote Control Kit $60.00
WPC-140 Waterproof Outdoor Housing $199.00

⅔" CCD COMPACT COLOR VIDEO CAMERA
Comes with Built-in Auto Iris Lens Plus a Wide Angle Conversion Lens
MODEL CCD-G1S OUR PRICE $749.00 NEW!
• ⅔" CCD image sensor for high resolution, long life and high resistance to shock/vibration
• Built-in 15mm F1.6 auto iris lens
• Auto tracking white balance control 2800K to 7500K
• Video composite and Y/C separate signal output
• Remote iris control override configuration
• One multi cable connection
• Especially designed for computer interface
• Easy to install with bottom ¼" - 20 thread • Supplied with wide angle conversion lens (ratio 0.8X)
SPECIFICATIONS
Lens: Auto iris F= 15mm, F 1.6 (with wide conversion lens) F= 9mm, F 1.8 (with conversion lens)
Focus: 3 position Color: EIA standard NTSC color Y/C separate signal, luminance with sync, chrominance with burst Scanning Systems: 525 lines 2:1 interlace 30 frames/sec Sync: Internal
Horizontal Resolution: 320 lines S/N Ratio: 45 dB (Y signal) Minimum Illumination: 10 lux (1.2 ft candles) Power Requirements: 6 V DC 33 W 12 pin connector Size: 2 7/8 W x 2 1/2" H x 5 D
Weight: 1 lb Accessories Supplied: Camera cable 2m (6 ft.) Wide conversion lens

is a very good deal since the CCD module will cost at least this much from Amperex.

The Uniden security camera will be a popular item amongst ATV'ers. Although requiring a fair amount of light and having a reduced resolution, this camera is inexpensive and very light! It comes with a monitor and is designed for outdoor mounting. It has a built-in electronic auto-iris and can be stripped down to an incredible 2.5 ozs. for use in R/C models. This camera is available with a monitor from P.C. Electronics 818 447-4565 or DAK Industries 800 325-0800 Dak order # 5289.

If you know of any new and interesting cameras please let us know so we can spread the word.

NATIONAL ATV LINKUP VIA SATELLITE!

Those who have access to satellite TV uplink facilities and would like to hook up your local ATV group or repeater into the first national ATV satellite linkup please contact Mike Scott N6GOZ, 73 Willow Ave.; Walnut Creek, CA 94595 or telephone him at 415 264-2393 or 415 732-3531. This would be downlinked via a C-band TV satellite and viewable by everyone who has a TVRO home satellite Dish system. This should allow you to work some REAL DX!! The timing for this event will be announced in the next issue of ATVQ.

MONTROSE, PA

Hi Folks! Happy New Year! Henry KB9FO, Bill WB8ELK, Sylvia (Good luck on the call), Tom W60RG, Dave WBOZJP. Just a note to say Thanks for the mention in the ATVQ about the repeater efforts here. Draining the swamp goes slow with all the alligators. If you were to look on a Pennsylvania map chances are good you would not find Montrose. It's the County Seat of the county of Susquehanna (a country hunter's treasure) and the average elevation above sea level here is a little over 1,600 feet. The local club is very luck to have one of its charter members working for a concern that has a tower on top of this mountain to which he has access. He has had the ELK MOUSE (as the I.D. reads it) 2 mtr. repeater there for many years. Unfortunately we stand a better chance of moving my ATV repeater into Fort Knocks than next to the FAA tower at ELK. So, for the present, my back yard is going to be the home of the KM3E ATV repeater.

The back yard stands at 1,800 feet above sea level without any close-by interruption in the line of sight for about 5 or 10 miles. Montrose is within 20 miles of the PA/NY border, with the most mountainous direction looking north into NY. The view south is open for at least 40 miles clear, great for Scranton and Wilkes Barre PA. Time will tell.

The tower is a homemade tilt over crank up and with the new top section, it gives its receive antenna a view from 94 feet. The receive antenna is directly below at 70 feet. The antennas are Isopoles. Ten watts out on 421.25. My practical experience in 70 cm. comes from OSCAR 13 endeavors which were, happy to say, gratifying. Hopefully this will help in antenna and feed line installation for ATV. My wife Becky N3COT is still reeling over the 4 hard-line connecters at a total of $160.00 HI.HIGH.

Realistically, I expect there will be some stations on the repeater in two to three months, depending on our coverage. Who knows--the repeater is not functional yet.

I scraped the old TV that I fed the IF from the invertor into, in favor of the PC VRC-45 board which arrived finally on February 14. I think Tom from P.C. had only one eye open when he checked the fit of the VRC-45 into a Hammond box number 1590 C--it just doesn't fit. But, that's what he shipped me to use with this board. So I must find a larger box. He doesn't sell feed thru caps either, so must add that to the shopping list. He suggested A house in Phoenix for those, and I ordered a half dozen .01 mf. Unfortunately I see now, after I received the board that I should have ordered a value of 500 to 100 mf. And they call this fun?? Our local Susquehanna County ARC had handled the safety communications for a world class bicycle race in our area for several years. Each year I have had the honor of acting controller for the net. There are several races held over a 10 hour day The longest of which is a 145 k. Hopefully (if it's ready by July) the ATV will be utilized somewhat during this next year's race.

Our local Montrose TV store owner Berni KA3OQB has been a great help in getting the repeater up and close to running. I'm sure TOM W60RG would like to help, but somehow I just can't find his wavelength. Every time we communicate I become more in questions. I have my own nice new dual trace scope now, so won't have to borrow that piece at least. Guess I'll still opt to borrow the H.P. spectrum analyzer though. HIHI

I guess ATV repeaters ARE pretty simple but the general contracting trade that I'm involved in doesn't really offer much of a background for an ATV "ace trouble-shooter." Finishing off a small room in the shed has posed no problem at all compared to figuring out how things in that ATV box work. Guess I'm getting the hang of it though. After reading the article in January ATVQ about "ATV out West" I called, and then sent a blank tape out to the Western Washington Association of Seattle Washington. They sent me back a copy of a really great video tape as the article had described and I certainly appreciate the FAST service getting it here on time.

Any club that has a video tape library should have this tape. Information on special modes is most times hard to find for the new guy or gal. This tape introduces ATV very nicely!

This worked out with great timing to be included in a planned entertainment program for a newly formed A.R. Club in the neighboring Wyoming county to the south. The Club is called the "Endless Mountain A.R.C.", named the same name as the surrounding tri-county area. Looks like a couple of ATV'ers may blossom from the program.

For the record:

There is no more K3QFW ATV repeater in Williamsport, PA

There is no more K2QIE ATV repeater in Vestal, NY

THE KM3E REPEATER IS ALIAS ALL THE ABOVE!

THE KM3E ATV REPEATER IS AWAITING THE ARRIVAL OF A BOX FOR THE INSTALLATION OF A PC COMPANY VRC45 IF/ATV RECEIVER MODULE.

THIS WILL REPLACE THE AILING TV SET USED IN THE RECEIVE.

Is the KM3E repeater coordinated?--whoops...No, but that's in the process.

Repeater IN frequency 439.25...OUT frequency 421.25 at 10 watts. The repeater receives vertical antenna is at 94 feet the vertical transmit at 70 feet. Two meter audio input will be 146.430. The antennas are ISOPOLE 440.

Sincerely, Elmer Taylor KM3E

14 Lincoln Ave., Montrose, PA 18801

DAYTON HAMVENTION '89

Thousands of hams descended on O'Hare arena once again for the annual Dayton Hamvention. Interest in ATV was quite evident by the huge turnout to the W6ORG ATV Forum on Saturday. ATV equipment suppliers were on hand with all kinds of new goodies to entice us. P.C. Electronics had a packaged 900 Mhz transmitter TX-33 on display as well as XTAL controlled downconverters for the 900 and 1200 Mhz bands. They also had the D-100N 100 watt Mirage amplifiers which were designed with a 1 watt input in mind. Tom has also come out with a VOR-2 video operated relay with new timing features which should prove useful for ATV repeaters.

Wyman Research (Don Miller W9NTP) had a new line of ATV transceivers on hand, The TRIDON (Try Don) Line. These have the useful feature of transmitting both subcarrier as well as on-carrier audio at the same time. They also are providing an add-on board to receive on-carrier audio internally in the rig. There was also quite a lineup of new rigs for FM ATV on the 900 and 1200 Mhz bands.

AEA made their entry into the Ham TV market with the introduction of their FSTV-430 1W ATV transceiver with vestigial sideband filtering. Also on display were their latest all mode TNC's which included the ability to receive FAX.

Spectrum International had their fine lineup of transverters, down converters and filters on hand. They now have an excellent VSB filter for the 1200 Mhz band and were carrying a 900 Mhz version of the J-Beam.

Lindsay Specialty Products had some interesting Amateur TV antennas displayed. One of the most interesting designs was a well-built omni-horizontal repeater antenna. Originally designed for low power commercial TV stations these could be tuned to the ATV band with 7.9 dBi max. gain and 5.9 dBi gain min. (as measured at the Dayton Hamfest antenna measuring setup).

Others with displays with products of interest to the ATV were Pauldon, TX/RX, Science Workshop with their spectrum analyzer kits, and the fine line of ARR preamps.

Nearly 50 ATV'ers attended the Friday ATVQ meeting at the Travelodge. This was an informal gathering with presentations and discussions pertaining to ATV. We had a presentation on ATV balloons, Chuck W7SRZ talked about the Western Washington group and played their professional edited "This is ATV" tape. Everyone got a chance to talk about their ATV activities in their area.

Dave Pacholok even had his microwave oven ATV 2400 Mhz xmitter there to warm up the snacks and make contacts!

The $100 grand prize for the Homebrew contest was split between Dave Pacholok for the microwave oven TV transmitter and Mike Collis WA6SVT for his 1200 Mhz VSB filter. * (Photo Right)

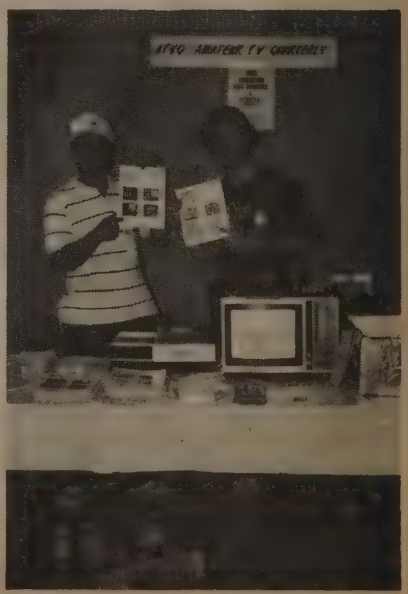
ATVQ will sponsor a similar ATV party next year at the same location and time. The Dayton 1990 ATVQ party will be organized and hosted by Chuck W7SRZ of the Western Washington ATV club. Folks who would like to have presentations are requested to contact Chuck. As usual we will have plenty of FREE snacks! and a $100 prize for the best homebrew entry. Because of the hassel of lugging heavy items to Dayton and then not having room for plunder to take home, you can submit photos of your project and a short write up (not to exceed 2 pages).

The ATV FORUM on Saturday featured Tom O'Hara W6ORG with an introduction to ATV with a question and answer session, Bob Rau N8IYD with his ATV rocket--no matches allowed.

Dave Pacholok then demonstrated his microwave oven ATV system on 2400 Mhz. We all had a warm glow about us after this fine lineup.

This was a very wet hamfest. Friday and Saturday saw a lot of downpours throughout the day. Fortunately, Sunday turned out to be a banner day. During my trip through the flea market I spotted a number of goodies. There seems to be a new trend in keeping the new electronic devices from overheating. I picked up a satellite receiver, tilted it to one side and watched as the water gushed out of the chassis! (Guess they must be water-cooled!).

The gang at ATVQ would like to thank all those who stopped by the booth to visit. Also thanks to Mike WA6SVT and Jeff KA8WLV who helped man the booth.



ATVQ DEVOTED ENTIRELY TO HAM TV

WYMAN
RESEARCH
QUALITY
Lindsey
COMMUNICATION
ANTENNAS

INDY 500 FESTIVAL PARADE

The first coordinated effort at televising the Indianapolis 500 parade was made this year on Saturday, May 27, 1989. Coverage was provided to the 500 Festival committee to assist them with live color pictures of any problem areas they might encounter. Monitors were also provided for the Indianapolis Fire and Police Departments as well as American Red Cross.

The ATV network consisted of eight cameras positioned at five locations as follows: CAM 1 was located on the 28th floor of the INB building and covered the first four blocks from the starting point to the first turn at Penn & Ohio. CAM 2, also on the 28th floor of INB, then picked up the route from Penn & Ohio to the next turn at Ohio and Meridian. The two blocks from the 2nd turn to Vermont were covered by CAM 3 which was located on the 15th floor of the Browning Building at New York and Meridian. The route from Vermont and Meridian to North was handled by CAM 4, also on the 15th floor of the Browning Building. CAM 5, located on the roof of the American Legion Building at North & Meridian, furnished coverage from Michigan Street North to 9th Street. Jack Parker, NT9J was positioned on the roof of Landmark Center Building at 11th and Meridian with his Sony Betacam News CAM (as CAM 5) provided excellent coverage of the four blocks from 9th to 14th Street on Meridian. Cam 7, also on the roof of Landmark with another news camera, filled in the route from 14th to 16th Street. Last but not least was CAM 8 on the roof of Grain Dealers, who provided shots from 16th Street to the de-marshalling area.

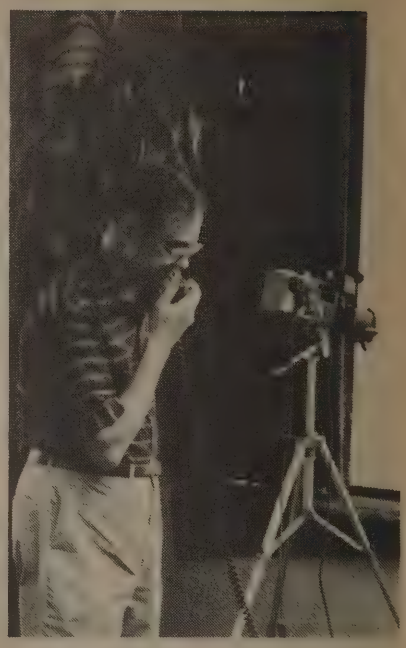
Four 439.25 MHz transmitters were used at INB, Browning Building, American Legion and Grain Dealers to relay cameras 1 through 5 and CAM 8 to Landmark where the Net control and camera switching was located. Equipment at Net control consisted of the following: 439 MHz receiver, video proc amp, time date generator, character gen, video ID board from Elktronics with special graphics for the parade, line scope, 6 input video switches and two-meter communications radio. The four camera locations with 439 MHz transmitters used horizontally polarized beams aimed at Landmark.

This, plus the use of a lower sideband converter and filter at Landmark gave us pictures free of interference from amateur or commercial sources. The use of horizontal beams and low power transmitters also prevented any pick up of the camera sites by our ATV repeater which uses vertical polarization. Additional isolation of the repeater site from the camera link transmitters was gained from the fact that all transmissions to the switching point at Landmark were in a north-south line and the repeater is located off to one side of this line by six miles.

The parade coverage was fed to the repeater as follows: A 2 GHz link was used to get the signal from Landmark to the Channel 8 transmitter site which is located about 2 miles south of the ATV repeater site. A 439.25 transmitter at the channel 8 site then transmitted the signal to the ATV Repeater.

The parade control point was located at the corner of North and Penn. Monitors for the various agencies at this location were fed via 900 MHz link.

Our crew for the event consisted of the following: Coordination with the 500 festival--Malcolm, WA9BVS. Tech committee, net control--Larry WB9YAJ/Paul--W9DUU, CAM 1--Malcolm, WA9BVS, CAM 2--George, W9VMT, CAM 3--Bernie, KB9AWS, CAM 4--Tom, KC9JX, CAM 5, Bob, W9PRD/Chuck, WB9IHS, CAM 6--Jack, NT9J, CAM 7--Roger, K9OPO, CAM 8--Mike WD9AVQ, Parade Control Point--Mike, WA9FDO, Kevin--N9FWB, Jerry--N9FAN; Operations: Jim--AF9A, Ron--KA9VWR, Steve--N9HQO, Barb Crist



REMOTE PUSH TO LOOK MOD FOR P.C. ELECTRONICS TC70-1

Andy Carstarphen — WY5V

Here is a simple mod for those of you out there who own the P.C. Electronics TX70-1 ATV Transceiver. This project only requires about 15 minutes and adds a very hand feature to your TC70-1. There are a couple of ways to key up the TC70 unit. One is to use the manual transmit switch on the front panel. The second is to insert a plug into the push-to-look jack on the front panel and wire a normally open switch to the plug.

In looking at the schematic diagram of the TC70-1, it is easy to tell that all that is required to key the TC70 is to take one side of the switch to ground. That is what we shall do using a small signal transistor such as a 2N2222 or 2N3904. On most VHS style cameras that will plug into the 10 PIN camera connector on the front of the TC70, there is some type of button provided that, when connected to a VCR, pauses the tape during record. The PIN that supports this function is not used by the TC70. This mod will turn that button into a remote push-to-look button.

Tools required - small screwdriver, soldering iron.

Parts required - 1 22K OHM register, 1 2N222 or equiv. NPN transistor..

Procedure -Remove top cover of TC70, locate push-to-look jack on front panel. Solder collector lead of transistor to the ungrounded side of the switch (the side that is wired back to the board). Solder emitter lead of transistor to ground. Solder one end of 22K OHM resistor to the base lead of transistor and the other end to PIN 6 of the 10 PIN camera connector. Replace cover. This complete the mod.

Some Notes on Operation:

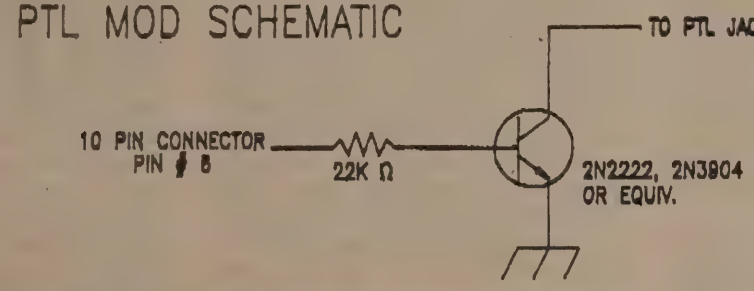
1) Some cameras have a switch to select whether the tape pause is a positive or negative signal. Set the unit for positive operation.

2) The "record" indicator in the viewfinder is now a transmit indicator.

3) The PTL action is a toggle. Push to transmit, again to receive.

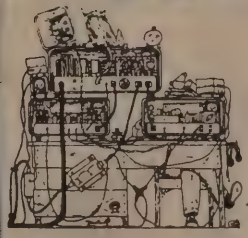
4) If your camera has an automatic fade function, you can have some nice special effects. If you push-to-look the camera will fade out, key the transmitter and fade in. Push again and the camera will fade out and unkey the transmitter.

5) The camera power switch on the TC70 must be turned on. See diagram below.



Balch Springs, Texas 75180

WY5V



HAM ASSOCIATION OF MISSOURI

Andrew D. Carstarphen
12904 Elam Road, Apt. 402

CONVERSON OF THE STANDARD COMMUNICATIONS MDS CONVERTER MODEL MDSD-10 TO THE 13 CM BAND

By Mike Collis WA6SVT

Originally the converter was designed to convert 2154 MHz to TV Channel 3, high side L.O. injection. After conversion we will convert 2430 MHz to Channel 3 AM ATV or 70 MEG FM ATV with low side injection. In the converter's original form, the converter was mast mounted in a horn launcher with a three foot long rod and disk directors. The bandwidth on the directors was in the 80 MHz range. This is unusable at 2430 so the rod and disc should be removed by unscrewing the rod. The 1/4 wave probe and horn works well at 2430 MHz and makes a nice system to excite a dish antenna. A bipolar RF amplifier brings the noise figure down to approximately 4 dB. Total conversion gain is in the 25 dB range and RG-6 cable can be used for the power-IF feedline. Power is supplied by a -15 to -18 VOLT power supply--A/B coax switch. Some power supplies have an AFC circuit to lock on the L.O. to a desired signal and is switchable in or out. Also, all supplies have a fine tuning front panel adjustment.

Conversion:

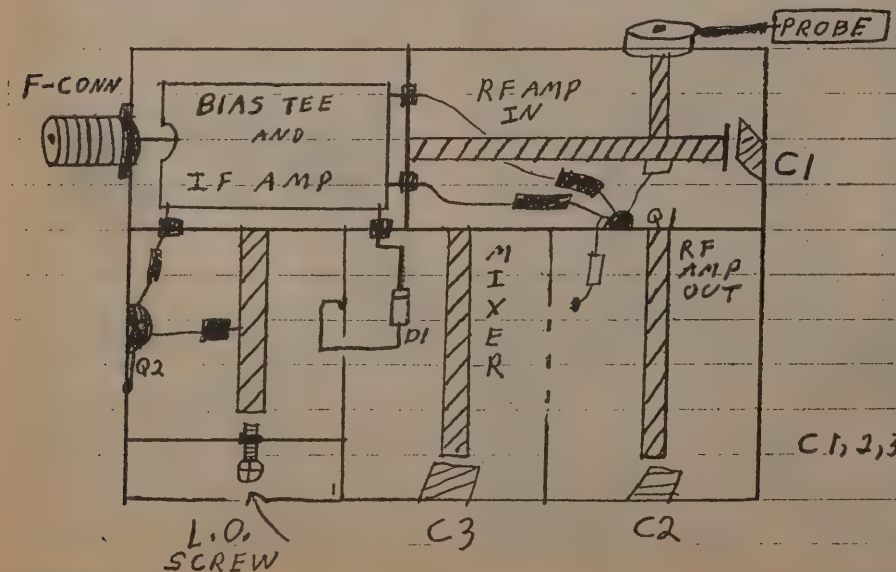
Tools and Test equipment; RF signal generator 2 to 3 GHz range (mandatory); non-metallic tuning tool (mandatory); spectrum analyzer 3 GHz range (optional); frequency counter 3 GHz range (optional); TV set (Mandatory).

Step 1: connections; Connect a 75 OHM cable from TV set to TV OUT on power supply, connect wall power box into AC outlet and DC plug into power supply box. Connect a short length of RG-58 into converter. This will require removing the converter from the horn by removing the nut on the F-connector and sliding out the converter. With an Allen set, loosen the black set screw in the middle and the large nut from the converter. Pull the probe and RG-141 hardline out. Insert RG-58 and reassemble. The RG-58 should be outfitted with a connector to match your signal generator. Connect a 75 OHM cable from the converter to the power supply F-connector labeled Converter.

Step 2: Testing; Set the generator to 2154 MHz, attenuator to 500 microvolts with some sort of a modulation or wide pulse. Turn the TV set to Channel 3 or 2, 4--whatever is not in use locally in your area. Turn on the power switch. A picture should now appear (modulated bars, etc.). A slight adjustment of the fine tuning should lock it in. Now adjust the attenuator for about 5 microvolts. The signal should be visible in the snow on the TV set. If the converter is in working order, proceed to the conversion step..

Steps 3 and 4: Conversion; If either the frequency counter or Spectrum Analyzer is available, using a probe, measure the L.O. It should read 2215 MHz + or - 10 MHz depending on IF out for 2154 MHz input. Now, tune the L.O. adjustment screw for a new L.O. of 2369 MHz (channel 3) or 2360 MHz (70 MHz). Set generator to 2430 MHz. Now adjust the RF amp and mixer stages by pulling away the pad plates from the cavity lines for best picture. Some filing may be necessary on the end of the cavity lines.

Step 4: If no spectrum analyzer or frequency counter is available, Step 4 is for you. Move the frequency generator up from 2154 MHz to 2174 MHz (20 MHz step), read just the L.O. screw to reestablish picture. Now re-peak the pads for best picture. Repeat this process for a total of six steps (140 MHz increase). Now set the generator to 2416 MHz and peak up the pad plates for best picture. Now set the generator to 2430 MHz and set the L.O. screw to reestablish picture (a sleight adjustment is all that is needed). Readjust pad plates for best picture. This completes the conversion. Noise figure should be 5 Db or less and conversion gain 24 dB or better. A GaSFET LNA would compliment this converter well. For a super fringe converter, this would probably give a 3 to 4 Db improvement in signal to noise ratio. I have several hundred units available. $35 conv.+ supply as is. $90 tuned and tested on 2430 MHz. 73's - Mike Collis WA6SVT, P.O. Box 1594, Crestline, CA 92325.



LET THERE BE LIGHT

Warren N4RUC

God's words after six days of labor on earth. However, He didn't have in mind what is being planned for the lower forty of Alabama by a group of local Radio Amateurs in Mobile. We're thinking in terms of light emanating from the phosphors on the face of a CRT (Television tube).

While Birmingham has two ATV repeaters and Selma has one repeater, according to the 1988 Repeater Directory, Mobile has tried FAST SCAN ATV only once or twice--the most recent being a joint effort by the Civil Air Patrol and the Mobile County Emergency Management Agency. This never really got off the ground due to problems with the unit intended for air search and rescue efforts.

N4RUC, KC4HCT, and KC4GRJ have made plans to have a station or two on the air by the end of January, 1989. Discussions held with KA4PAV, Communications Officer for the local C.A.P. Squadron, and others, have indicated much interest in the project. Springhill College has recently opted for an on-campus Amateur Radio Club and has expressed interest in possibly using some of their communications facilities in an ATV endeavor. Much support and encouragement has been given by W4DHG, an Alumni of the college. The college has a radio tower with good elevation, ideal for an ATV repeater.

If suitable progress can be made and a successful station can be put in operation by the tentative target date, perhaps the County Emergency Management Agency will become involved again.

All equipment for a basic station is on hand, except for the transmitter. The decision on this is being delayed until the new 70 cm unit that A.E.A. is developing is marketed.

The first ON THE AIR tests of Mobile's ATV endeavor was not scheduled to take place until mid-January, 1989. However, when the C.A.P. learned that everything was in place but the transmitter, they immediately set up a test between N4RUC's location and the Mobile County Emergency Management Group for 9:00 a.m., December 14, 1988. Alas, a Christmas meeting took priority so that test wasn't conducted until December 27, '88, at 9:30 a.m. Using Civil Air Patrol equipment in a temporary set up, successful P.5 pictures were transmitted from Wragg Swamp to Mobile County Emergency Management's site. Equipment used was a four year old (with multiple modifications), 10 watt transmitter, feeding into 85 feet of Belden 9913 cable and driving a dual band, vertically polarized NCG antenna, 57 feet in the air. This is an omni-directional antenna with a quoted gain (dbd) of 11.5. dB. An isopole antenna working into a conventional down converter at Emergency Management's site provided received signals suitable for taping.

January 2, 1989, N4RUC ordered the transverter, along with a 50 watt Mirage/KLM amplifier from P.C. Electronics in Arcadia, California. Tom, W60RG,, and Maryann, WB6YSS, are very cordial and easy to work with. Due to the increasing popularity of 70 cm FSTV, the equipment was back-ordered and didn't arrive in Mobile until January 23, 1989, for the transverter and on January 24 for the amplifier.

The advent of Mardi Gras starting on January 24 put a kink in over all tests, but, pictures and test patterns have been transmitted two miles on one watt PEP (p-1 and P-2 received). This proved conclusively that regular television sets alone are not capable of ATV reception direct. The signal simply isn't strong enough. Subsequent tests from a roving Jeep, using a home brew QUAGI from the ARRL Handbook and a varactor tuned 10 inch color TV, normally used for off-the-air reception in N4RUC's shop, produced P-5 pictures with sound quality exceeding what normally is received in the home. The one watt represented an ERP of approximately ten watts at the antenna, while the linear correlated to approximately five hundred watts PEP. This is simply not enough signal for receivers built to be slapped with signals from antennas radiating 100 to 500 kilowatts. So, as of now, we have proved to our satisfaction that the books and specifications are right. There is a twenty db or more loss in received signals when using cross polarized antennas. The nominal cost of a low noise down-converter, low loss cable and an antenna with good gain, is a wise investment for transmitting or receiving ATV pictures.

For example, a P-1 signal was received at Pensacola from N4RUC using a moderate gain vertically polarized antenna driving a popular cable ready VCR. In about two weeks, more conclusive tests will be conducted utilizing proper equipment at both ends. Anyone wishing to know specifics on equipment, costs, overall results or sources may contact me, N4RUC, Danny KC4HCT, or Herb W4DHG, after these tests are completed and we will be glad to give you a complete rundown. In the meantime, ATV's second generation is up and running in Mobile and hopefully will continue to expand. "See you on TV" Warren, N4RUC

JACKSONVILE, FL

ATV in Jacksonville is the new and up coming form of Ham Radio communication. Starting on April 1 look for a beacon on 426.250 Mhz. Transmitting 10 watts from the Northside Twin Towers Building (site of the 147.330 R.A.T.S. repeater). Mike Baker WA4HFR from Gainesville will have a beacon with GOES Weather Satellite Imagery updated every 30 minutes. For more information or answers to any questions you may have, feel free to contact me. Wayne Chandler N4KWC Phone 904/764-3846, 9425 Sappington Avenue, Jacksonville, Florida 32208.

AOG DOWNLINK

Mike Mauldin WO4AOG has been retransmitting audio from the Shuttle Missions for the last year or so on his 2 meter repeater 147.120 as most local Hams know. But did you know he gets the audio from his satellite receiver of which he also gets video. So get into ATV and watch the mission at home or in the mobile. For information on Mikes retransmitting of Space Shuttle Adventures give him a call. 904/744-2803.

WAPE WEJZ TV-12:
Tower Camera

For the Jax River Run this year, we were able to have ATV coverage. Camera 1 was on the Crows Net at 500 feet with N4EPD Mike Parnin. Camera 2 was Mike Mauldin WD4AOG located on the top of the Gator Bowl stands looking over the crowd.

Camera 3 was WD4ASW. Barry Baines. Located at the start-finish line. In our ARES Trailer, we had our receiver and VCR with TV. On a simplex 2 meter freq., I qued up and down cameras.

ATV FLY AROUND

Back in September and October of 1988, Herb and I were involved with the Department of Forestry in which we flew around the North Florida area with their pilot Al. We were able to see video from the plane 10-15 miles with 1 watt with an inside antenna. Power connections and antenna mounting connections and antenna mounting were some of the problems. Also when near the commercial TV transmitters, they would wipe out our equipment.

ATV DOF

Department of Forestry's drill was held in Nassau county on October 15, 1988. Garry Coe N4UMD and myself (N4KWC) went up in a Hughes Helicopter sending ATV to Herb N4MJN at the drill Command Post Bus. Other choppers were scooping up water from ponds and dropping the water on smoke bombs on the ground. While videoing that and hanging out the open door, we found out that our 2-meter HT's would wipe out the video in my camera. By our involvement in this drill, we have opened doors for statewide interest in ATV. We have suggested that they install a standard power connection and antenna in their aircraft fleet. With that they could call any ATVer to assist with a major fire.

USS MAPLE LEAF
RECOVERY DIVES

As most local hams know, Keith Holland, WB4KKX has been involved with the discovery and recovery of the MAPLE LEAF ship. The MAPLE LEAF was a Union ship that was sunk by a Confederate mine in the St. Johns River in 1864. The ship is located off Mandarin point, just south of the I-295 Buckman Bridge. Starting this month, we will begin ATV coverage of the excavation of artifacts from this Civil War ship. We will be transmitting ATV from the recovery barge to shore, for the media and public interest. ATVers here in Jacksonville should be able to see this rare and exciting coverage.

TEX GETS ATV

Tex W4MET is the newest ATVer here in Jacksonville after buying a AEA FSTV-430 at the Orlando Hamfest. I was standing by him when he bought it and it looks to be a real nice unit. The price of the transceiver is in the low 400 dollar range. Tex should be able to see the ATV coverage of the Maple Leaf recovery dives int he St. Johns this summer.

RATS GET ATV

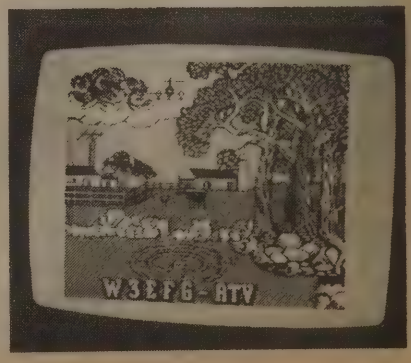
The Radio Amateur Technical Society 444.975 Repeater is off the air while there is a ATV beacon hooked up to the 440 antenna. The beacon is turned on when the 147.330 RATS repeater is transmitting. The repeater audio is also transmitted out on the ATV signal. The normal ATV beacon transmit power is 1 watt. With the capability of transmitting 50 watts. Most of the local ATVers have been receiving this beacon.

ATV GOES FISHIN'

Robert KC4HEL was the camera man recently at the MO/Q1 Fishin' Tournament where John WA4CDZ, Mike N4NEO, Wayne N4KWC, Russell AA4MO and Henry AA4Q1. One of the more unusual catches of the day was when Mike N4NEO caught two catfish on one line. While almost all that were there caught fish, the winner was Wayne N4KWC, with the only two edible fish. I understand that the check is in the mail for the winner.

MO TO BE NEXT ON ATV?

Over a year ago Russell AA4MO had installed a new beam antenna for ATV on his 80'+ tower. He used Beldon 9913 coax for low loss on ATV frequencies. During the testing periods last year N4KWC had loaned him his ATV receiver (downconverter), that had worked very good. Russell has only to purchase his receiver ($59) to become a true ATVer. Ask him if he got his downconverter the next time you hear him on the radio. Mike N4EPD may be the next on. (By N4PTG)



NEW ATV REPEATER IN DENVER UNDER CONSTRUCTION

The Denver, Colorado area ATV group, Western Vision Network, is in the process of constructing a crossband fast scan repeater. Operation will be 426.25 mhz input/-1253.25 mhz output, from a transmitter site west of Denver on Lookout Mountain. The repeater site is about 7,400 feet above sea level and should provide excellent coverage to the Mile High City. Nearly all of the components being used to build the repeater are being donated by various manufactures in the cable television industry.

For example, the repeater input stage will be a Scientific-Atlanta headend video demodulator, and its output exciter a modified DX Communications headend modulator. Lindsay Specialty Products is providing a custom built UHF low power TV antenna for the repeater input (6.5 dbi gain horizontally polarized omni-directional) and Microwave Filter Company the input bandpass filter. Cabling and connectors will be standard CATV 75 ohm hardline.

About the only parts of the repeater that won't be supplied by CATV manufacturers will be on the output power amplifier stages, and the 23 cm transmitting antenna. The Denver group plans to build a 16 bay travelling wave antenna that is expected to provide horizontally polarized omni-directional coverage. The antenna, whose design is based on Andrew's Trasar series of UHF broadcast antennas, should provide about 12 dBI of gain (look for design information in an upcoming issue of ATVQ).

Western Vision Network expects to begin initial on-air testing of the repeater in late April. NOIVN

ATV Beacon

A landmark day for the Western Vision Network occurred on December 31, 1988 when the WVN fast scan beacon underwent installation and testing. Its first full day of transmission was January 1, 1989, inaugurating a new year with a new mode of operation for many Denver area radio amateur operators.

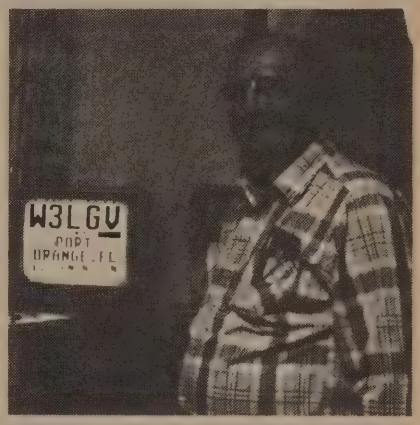
The 426.25 Mhz beacon, which is active on evenings and weekends, transmits 17 watts of power into an omni-directional antenna 42 feet above the terrain and is located in Denver's south suburbs. Signals have been received throughout the Denver area. The beacon will be operational until the completion of WVN's crossband repeater.

The following hams contributed to the activation of the beacon: Bob, WB4ETT, tower climbing and antenna installation; Ron, NOIVN, technical set-up and equipment procurement; Doug, NQ9I, installation of equipment; Steve, NOAYE, ground crew and general help; and Tim, WBOTUB, ground crew and general help...WBOTUB.

Denver's ATV group, Western Vision Network, as organized last year to provide a public service to the National Weather Service, to promote amateur slow scan and fast scan television, and to assist interested amateurs with ATV communications and activities. WVN conducts a weekly net at 8:00 p.m. local time every Friday night on the 146.64 Mhz repeater (simulcast on 426.25 Mhz simplex ATV), and also supports an open ATV activity night every Tuesday at 8:00 p.m., with activities coordinated on 144.34 Mhz simplex. The officers of WVN are: Director, Tim Armagost, WBOTUB; Operations Manager, Ron Hranac, NOIVN; Administrator, Bill Grene, WOGVT; and WVN Monitor Editor, Tim White, NOISE.

Members of Western Vision Network have been active in a numb er of experimental ATV endeavors. Last April, for example, the group transmitted what is thought to be the first application of MTS stereo audio with fast scan video. The stereo audio signal, generated in a cable television BTSC encoder, consisted of a Morse Code ID on the left channel and voice on the right channel. The Denver hams received a nice write-up in Communications Technology, a CATV engineering magazine.

WVN members are now experimenting with slow scan transmission on the SAP subcarrier of an MTS audio signal that accompanies fast scan video. They also are conducting ATV transmissions through single mode optical fiber at 1310 nanometers, using VSB-AM over 20+ kilometers of fiber prior to over-the-air transmission. Check the next issue of ATVQ for a detailed report on this!....NOIVN



WHY TOWER TOP AMPS IMPROVE RECEPTION

Low-noise tower top amplifiers boost reception a lot for some systems, less for others. Simple calculations predict how much an amplifier would improve your reception. Feedline loss and site noise are important factors.

By Ernest N. Mann

Mann is a communications engineer at Central Maine Power, Augusta, ME. His book An Introduction to RF Systems: Written for the Two-Way Radio Industry, is published by Mannbros Technologies, P.O. Box 2066, Augusta, ME 04330; 207/487-3751.

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How to achieve the highest possible receiving sensitivity is no secret: Amplify the radio frequency (RF) signal at the antenna, where the signal-to-noise ratio (SNR) is maximum.

The highest possible receiving sensitivity offers an obvious advantage, especially with systems that use portable transceivers. The more sensitive the receiver, the less transmitter power it takes to reach the base station. Portables usually have less transmitter power and poorer antenna efficiency than control stations or mobile units, so with improved base station receiver sensitivity, portables can be used more effectively. Communication with low-powered mobiles is improved, too.

Placed as close as possible to the antenna, a low-noise amplifier improves the SNR at the receiver from what it would be without the tower top amplification. This is because it amplifies the received signal before feedline loss attenuates it. The amount of improvement depends upon the amplifier's gain and noise figure, as well as feedline loss and ambient noise at a given site. You can find some of these characteristics in manufacturers' specifications, and calculate or estimate the others to help you decide whether to use an amplifier.

You can decide whether to use an amplifier by comparing system noise figures with and without an amplifier to reveal how much improvement it may offer. The system noise figure is the difference between the SNR at the antenna to the SNR at the receiver input. The system noise figure always improves when a tower top amplifier is implemented properly, assuming all other system characteristics are unchanged. Models presented below allow for the receiver noise effects, incorporating them into the analysis to determine effective sensitivity improvement.

Typical System

Use the system configuration shown in Figure 1 to calculate system noise figures with and without an amplifier. Feedline connecting the antenna to the amplifier usually is so short that loss is negligible, so consider signal and noise values at the antenna output and the amplifier input to be equal.

The feedline may terminate at a receiver or some other initial signal processing component, such as a preselector in a receiver multi-coupler. In the example, "receiving input" ,will define the signal processing component at ground level. Therefore, consider signal and noise values at the receiver input to be equal to those present at the bottom end of the feedline.

Important signal and noise locations in a typical system are:

Antenna output (tower top amplifier input)

Amplifier output

Receiver input (end of the feedline).

Without Amplifier Calculations

Your first set of calculations reveals the system noise figure (difference in SNR) without a tower top amplifier. Feedline loss does not change, so its calculation need only be done once. (See Figure 2) (1)Feedline loss-On the manufacturer's loss table, look up the type of hardline cable your system uses. The table shows loss in decibels per foot. Multiply the loss in decibels per foot by the length of feedline between your system's receiver and the top of the tower. The result is feedline loss in decibels. In the example, feedline loss is assumed to be 10 db. A 10 db loss figure may be quire high, but it is effective in showing how system noise figures differ between installations with and without a tower top amplifier.

Feedline loss affects system signal ratios (the ratio of signal at the antenna output or amplifier output to the signal at the receiver input) and noise ratios (the ratio of the noise at the antenna output or amplifier output to the noise at the receiver input), so feedline loss affects receiver sensitivity for this example.

(2) SNR, antenna output--The system designer sets a minimum acceptable signal voltage expected at the antenna for the desired audio quality output at the receiver. In the examples that follow, a minimum level is chosen; this level delivers the desired audio quality output only when a tower top amplifier is used. The minimum acceptable signal voltage usually ranges from 0.3 uV to 4 uV. The chosen level depends on the site's thermal noise characteristics and the system noise figure. Use the value you may find in the station records or estimate a new value that appears practical. For the example, the minimum, desired signal voltage is 0.3 uV, a satisfactory level for rural systems with low system noise figures.

Thermal noise voltage at the antenna is proportionate to absolute site noise temperature and is independent of frequency when absolute bandwidth and feedline input impedance are constant. Use Equation 1 to calculate the reference site noise voltage V. Equation 1 is derived from the concept of noise power transfer from a source resistance (antenna) to a matched load (feedline).

$$V_n = \sqrt{kTBR} \qquad (1)$$

where

k = Boltzmann's constant

= 1.38×10^{-23} joules per °K

T = ambient site temperature (290°K or 63°F)

B = effective system bandwidth

R = load impedance

Assuming an ambient site temperature of 290°K (63°F), a 15kHz receiver IF bandwidth and a 50Ω feedline,

$$V_n = \sqrt{(1.38 \times 10^{-23})(290)(15\text{kHz})(50\Omega)}$$

$$= 0.054\mu V$$

Therefore, the SNR at the antenna is $20\log 0.3\mu V/0.054\mu V$.

Equation 2 converts the voltage ratio to a decibel value:

$$20\log S/N = \text{(decibels)} \qquad (2)$$

Feedline Loss

Under these conditions: low site noise, 10 db feedline loss and no tower top amplifier, the SNR at the antenna is degraded by feedline loss, so SNR at the receiver input is less.

For the signal is attenuated:

$$20\log(V1/V2) = \text{(db)} \qquad (3)$$

If V1 is less than V2 the db value will be negative, implying attenuation.

In the example the 0.3 uV signal is attenuated by 10 db.

$$-10 \text{ db} = 20 \log x/0.3 \text{ uV}$$

$$x = \text{antilog } (-0.5)x0.3(10^{-6})V$$

$$= 0.48\ (10^{-8})V$$

$$= 0.0948 \text{ uV}$$

Similarly, feedline loss attenuates antenna noise voltage 10 db. If the resulting noise voltage at the end of the feedline is several decibels less than the receiver input's inherent noise, the feedline noise voltage is insignificant. Usually, without the amplifier, the feedline noise voltage is less than the receiver input's inherent noise, especially if the ambient site-noise level is low. The example uses a relatively low site-noise level involving only thermal noise generated from the earth's surface, as indicated by an antenna temperature of 290K (63F).

Receiver Noise Voltage

(4) Receiver input noise -- Thermal noise from the antenna and noise from the system noise figure affect the receiver RF input's effective noise value (the equivalent amount of RF noise from site noise processed by the receiver and noise generated by the receiver itself). For most receivers, the RF noise value of the receiver alone is approximately 0.075 uVrms, a voltage 10 db below a 0.25 uV receiver SINAD sensitivity specification. The 0.075 uVrms value is an estimate that is a function of several complex variables and one that is quite representative of a typical receiver.

The 0.054 uV antenna noise voltage, after being reduced by the 10 db of feedline loss, becomes insignificant with respect to the receiver's own noise.

Therefore, calculate the receiver input SNR with the feedline-attenuated signal voltage, 0.0948 uV, and the receiver noise, 0.075 uVrms, using Equation 2.

$$20 \log 0.0948 \text{ uV}/0.075 \text{ uvRMS} = 2 \text{ db}$$

It is apparent that an RF SNR of 2db certainly would not be acceptable to produce intelligible audio, considering that a 10 db SNR at the receiver input will provide a 12 db SINAD output. Similarly, the proposed 0.3 uV minimum acceptable signal voltage, chosen for the example, is anything but acceptable.

How much would a tower top amplifier improve the receiver input SNR? Make a second set of calculations to find the answer (See Figure 3). You can use many of the values already found, but you must also calculate a few new ones.

(1) Feedline loss -- Attenuation remains unchanged. In the example, it is 10 db.

(2) Signal and noise, antenna output/amplifier input -- Antenna signal and noise levels, which are fed to the amplifier input, remain unchanged. In the example, the received signal is 0.2 uV. Reference noise at the amplifier input is 0.054 uV (See Figure 2).

The SNR at the antenna output/amplifier input remains the same, 15 db.

(3) SNR, amplifier output -- Calculate the amplifier's signal voltage output based on the minimum desired received signal voltage and the amplifier's gain figure.

For example, a typical amplifier has 20db gain. With 0.3 uV input, 20db gain produces 3 uV output (20 db = 20 log (3 uV/0.3 uV).

Add the amplifier's noise figure in decibels to its gain in decibels, and use the sum to calculate the amplifier's noise voltage output.

For example, a typical amplifier has a 2 db noise figure. The input noise is 0.054 uV, so the amplifier output rms noise level is 0.679 uVrms (20 + 2 = 20 log{x/0.054 uV).

x = antilog (1.1) X 0.054 uV

Use equation 2 to calculate output SNR in decibels.

Using values in the example,

20 log 3 uV/0.679 uV = 13 db

Receiver input signal and noise

Feedline loss reduces values for signal and noise by equal amounts. The SNR at the amplifier output will be approximately the same as the SNR at the receiver input, provided the feedline attenuated amplifier output noise value is at least 3 to 4 db greater than the receiver RF input noise indicated in the previous section.

Use Equation 3 to calculate the signal and noise levels delivered to the receiver input.

Using values from the example,

Signal = antilog (-0.5)x 3 uV

= 0.948 uV

Noise = antilog (-0.5) x 0.679 uV

= 0.214 uV

The 0.214 uV, feedline-attenuated, amplifier noise level is much higher than the example's receiver set noise component, 0.075 uV, so it is the dominant noise component, 0.075 uV, so it is the dominant noise component and is used in the receiver input SNR calculation based on Equation 2:

SNR = 20 log 0.679 uV/0.214 uV

= 13 db

Notice that the receiver input SNR value is the same as the amplifier output SNR figure. The SNR figures are equal because the noise component at the end of the feedline (0.214 uV) is at a much larger level (about 12 db) than the receiver input set-noise.

component (0.054 uV).

In this example, the amplifier delivers a great improvement in input receiver SNR: 13 db with the amplifier vs. 2 db without the amplifier, an improvement of 11 db. This improvement in signal quality not only allows the desired minimum acceptable signal voltage level (0.3 uv) to deliver intelligible audio output, but it boosts other, marginal signal levels, providing both reliability and range improvements.

In the foregoing example, a site with a low noise level was used. Some sites suffer from high noise levels. How effective is a tower top amplifier in the presence of high site noise? (See Figure 4)

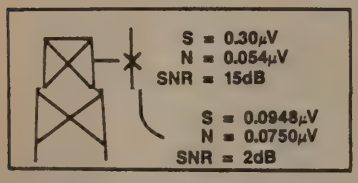

Figure 2. Signal and noise levels without a towertop amplifier.

Amplifier performance at a site with high noise is shown in the following example. It uses an antenna noise level 12 db greater than the first example's amplifier reference noise input level of 0.054 uV, calculated using equation 3:

12 db = 20 log x/0.054
x = antilog (12/20) x 0.054 uV
RMS = antilog(0.6)x0.054 uV RMS
= 0.215 uV rms.

In this example, noise received from the antenna is the major noise component. The antenna output/amplifier input SNR is derived form Equation 2:

SNR = 20 log 0.3 uv/0.215 uVrms
= 2.9 db

Remember that with low site noise, the antenna output SNR was 15 db.

With high site noise, amplifier output noise from noise present at the input "swamps" the amplifier's internal output noise component, which is because of the 2 db amplifier noise figure and thermal noise.

The output signal is 3 uV (antilog [0.5] X 0.3 uV), same as before.

Output noise is much greater, 0.215 uV (antilog [0.5]0 X 0.215 uV).

Output SNR of the amplifier is derived from Equation 2:

SNR = 20 log 3 uV/2.215 uVrms = 2.98 db.

With low site noise, the amplifier output SNR was 13 db, degraded only by the amplifier's 2 db noise figure.

In this example, the amplifier's 2 db noise figure does not have the lease effect on the SNR ratio between input and output because the noise figure does not degrade output SNR when input noise power is much larger than a amplifier's inherent noise power. The amplifier's inherent noise power is from thermal noise and noise figure.

At the end of the feedline, SNR once again remains the same as amplifier output SNR, in this example, because the site noise level at the feedline's output (ground level) is much stronger than the receiver RF internal input noise component. Generally, under high site-noise conditions, and particularly in this example, the low-noise amplifier does not offer as dramatic an SNR improvement as it does under low site-noise conditions. The proposed minimum acceptable signal once again is not strong enough to provide an adequate SNR at the receiver.

High site noise severely limits receiver sensitivity. A tower top amplifier does improve the SNR at the receiver at high-noise and low-noise sites alike, but the improvement it offers is much less at sites with high noise levels.

High site noise, no amplifier

The following example shows how to determine the effective SNR at the receiver for a site with high noise and without the tower top amplifier. The information is used to evaluate system noise figures and improvements in receiver sensitivities. This scenario is illustrated in Figure 5.

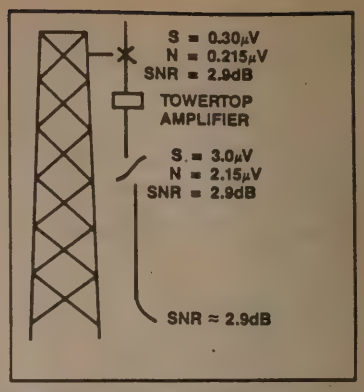

Figure 5. Signal and noise levels at a high-noise site, without an amplifier.

In the example, the received signal level is 0.3 uV, and feedline loss is 10 db, so the signal delivered to the receiver input, as derived from Equation 3, can be calculated:

-10 db = 20 log x/0.3 uV
x = antilog(-.05) X 0.3 X 10 -v
= 9.48 X 10 -8V
= 0.0948 uV

Next calculate the noise level from the antenna at ground level. The feedline attenuation value of 10 db and a site noise value at the antenna of 0.215 uV results in 0.067 uV antenna noise at the feedline (ground level). The antenna noise at the end of the feedline must be added to the receiver input RF noise because they are comparable. It would not hurt to always incorporate the effects of both site noise and internal receiver noise to find a composite noise value. Remember a 3 to 4 db difference dictates that only the larger level be used in the equation defining receiver input SNR. When this is the case, an approximate error of 0.5 db could result. Larger errors would occur if levels were within 1 or 2 db and both noise components were not incorporated into the analysis.

To add two rms noise components, use the equation:

$$\sqrt{(V_1)^2 + (V_2)^2} = \text{Vrms} \quad (4)$$

Using values from the example,

$\sqrt{(0.067\mu V)^2 + (0.075\mu V)^2} = 0.1\mu\text{Vrms}$

Use the combined antenna and receiver input noise level, 0.1 uVrms, as the noise value to

compare with the received signal in computing the receiver input SNR without the tower top amplifier.

At the high-noise site, without the tower top amplifier, the SNR at the receiver is derived using Equation 2 and the levels just calculated:

SNR = 20 log 0.0948 uV/0.1 uV rms = -0.4 db

A previous example showed that, with a tower top amplifier in place under high site-noise conditions, the SNR is 2.9 db. The improvement is the difference:

2.9 db - (-0.4 db) = 3.5 db

High/low site-noise comparison

You will find it useful to compare the SNR improvement for both the low and high site-noise cases. (See Figures 1-5 and Table 1)

Comparison table

Table 1 compares the improvements delivered by a tower top amplifier under the conditions spelled out in the examples for low site-noise and high site-noise environments.

SNR improvement is much grater in a low site-noise environment. That is why some sites show a great improvement in signal quality and range when a tower top amplifier is added and others show, at best, a modest improvement.

How much improvement can you expect? Tower top amplifiers improve reception for some systems more than they do for others. The greatest reception improvement can be expected when tower top amplifiers are installed at a site with relatively low noise level and/or a relatively high feedline loss.

Low site noise

First, for systems with low site-noise levels, feedline loss degrades the SN level present at the antenna to a lower SN level at the receiver. The feedline attenuates the antenna noise below the receiver inputs own noise level. Instead of the antenna noise limiting weak-signal reception, the receiver's inherent noise limits weak-signal reception.

The weak signal is present on the feedline but is masked by the receiver's own noise. A tower top amplifier boosts the signal and noise picked up by the antenna to higher levels before sending them down the feedline. Although the feedline still attenuates both, the signal and noise remain at much higher levels than the receiver's inherent input noise when they arrive at the input. Weak signals are not masked as much by receiver input noise because a low-noise, high -gain device can offset receiver noise to some degree and reception improves.

High site noise

At sites with high noise levels, the noise delivered by the feedline without an amplifier comes closer to the receiver input noise level. Weak signals are masked not so much by receiver noise as by the site noise. The SNR at the antenna is less to begin with than it is at a site with low noise. An amplifier always offers some improvement at a site with high noise, but the difference is not as pronounced as it is at a site with low noise. Mathematically speaking, this is because low system noise figures are not as critical when the input noise to the system is significantly larger than the reference noise of the signal processing components.

Second, the greater the feedline loss, the more it limits weak-signal reception. Because a tower top amplifier overcomes feedline loss, the improvement it delivers is more obvious in systems with larger losses.

Feedline loss and site noise levels are the most important factors to consider in evaluating the receiver-sensitivity improvement a tower top amplifier may offer. You should calculate the loss and measure the noise before deciding whether to buy an amplifier. If you are going to purchase an amplifier regardless of feedline loss and noise level, you still should include these characteristics as part of your consideration of other equipment purchases.

Feedline losses and noise levels differ from site to site, so amplifier performance at your site will differ from the performance shown in the examples. Use calculations to predict the results to except from using an amplifier at your site.

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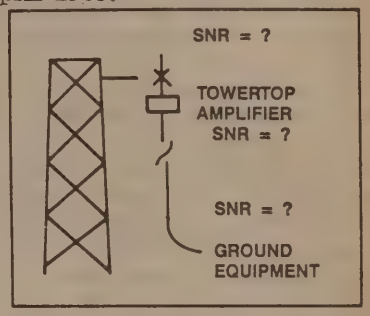

Figure 1. Important signal and noise locations.

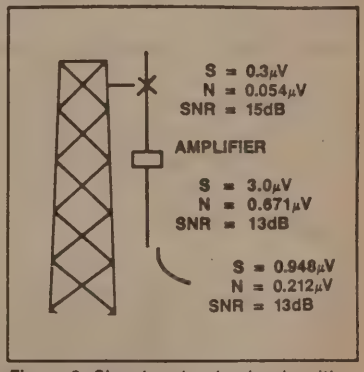

Figure 3. Signal and noise levels with a towertop amplifier.

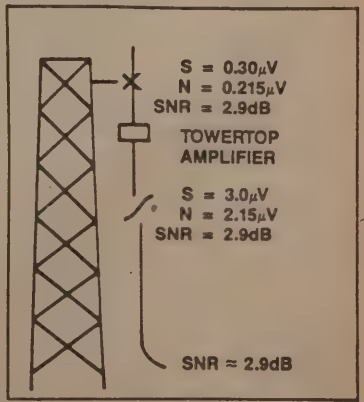

Figure 4. Signal and noise levels at a high-noise site, with an amplifier.

STATISTICS AND AUDIO VIDEO MEASUREMENTS
PART TWO: FIVE STEPS TO CONTROL

by Gerald B. Heyes

We have already seen from part 1 that when individual measurements are tallied according to frequency of occurrence they tend to be normally distributed in the familiar bell shaped curve known as the normal probability distribution. In the last issue of ATVQ we learned how to assess how close to normal a set of repeated measurements are and how to use the information to compute both accuracy and precision statistically.

We also learned that the distribution of averages taken in groups from individual measurements are almost always normally distributed regardless of the distribution of the original measurements. We will now use this information to assess whether or not our measurement process is in control and how to maintain a state of statistical control for our measurements. This is accomplished by constructing simple plots called statistical control charts which allow us to track both level (averages) and dispersion (ranges) of the measurements process.

Control charts were first invented by Dr. Walter A. Shewhart in 1924 at the Bell Telephone Laboratories. Shewhart and colleagues further developed them throughout the 1920's and in 1931 Dr. Shewhart published his famous text, "Economic Control of Quality of Manufactured Product". There has been a steady growth in use of Sherhart's methods since then but they became particularly popular in Japan after WW II allowing them to manufacture superior products and capture huge world markets. The 1980's have seen a great revival of control charts in the United States and Europe. WHile control charts have very wide applications, they are relatively simple to learn and to apply even for those with little mathematical knowledge.

The underlying mathematics that allows us to create control chart plots for averages, x is called: CENTRAL LIMIT THEOREM.

"Irrespective of the shape of the distribution of a universe the distribution of the average values, $\bar{x}$'s of subgroups of size n, ($\bar{x}_1$, $\bar{x}_2$, $\bar{x}_3$, ...$\bar{x}_k$) drawn from that universe will tend toward a normal distribution as the subgroup size n grows without bound." In fact the averages become rather normal with subgroup sizes as small as 4 or 5. Figure 1 illustrates this concept as we can clearly see that regardless of the original distribution of data averages from it are distributed quite normally.

Because averages are normally distributed we can compute expected limits based on available data. Measurements exceeding these limits can be considered "out of control" statistically. The measure of spread for averages themselves is called the Standard Error of the Mean ($S\bar{x}$) and is related to the standard deviation of individual measurements (s) by $S\bar{x} = S/\sqrt{n}$ where n is the subgroup size from which averages are calculated. It follows then that since the limits of averages are tighter by a factor of $\sqrt{n}$, averages are mire sensitive to changes in a measurement process than individuals and this is why we choose to plot averages whenever possible.

Before proceeding we must understand the concept of Rational Subgrouping. Subgroups of data are taken with the idea of minimizing the amount of variation within each subgroup. Therefore we select each subgroup of data from one region of space or time. We do this because it is the variation within subgroups that is used to put limits on variation between subgroups. Specifically the average range of $\bar{R}$ is used with special factors to compute limits on averages ($\bar{x}$ chart) and limits on ranges (R chart).

The control chart for averages is asking, "do the subgroup averages vary more than they should based upon the variation

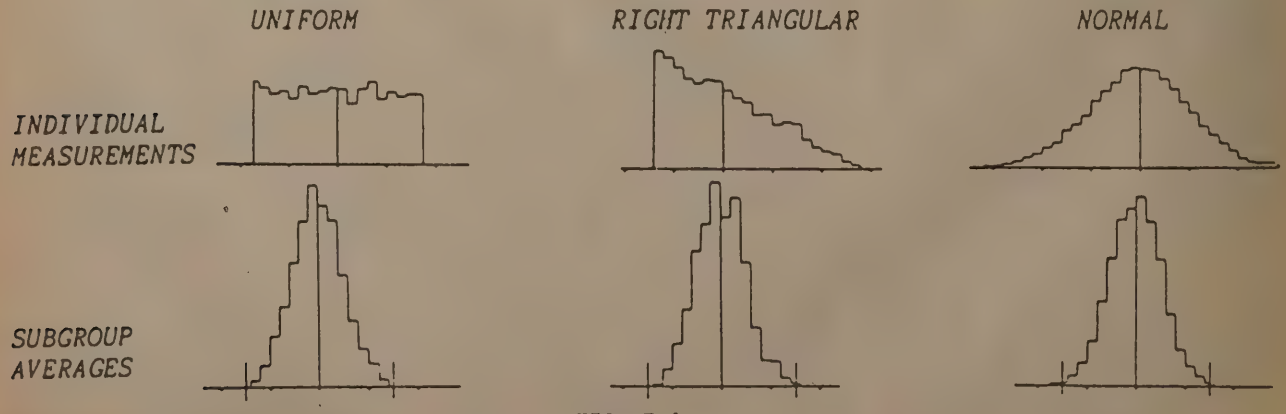

FIGURE 1

The CENTRAL LIMIT THEOREM Illustrated

within the subgroups?" The control chart ranges is asking, "is the variation within subgroups consistant from subgroup to subgroup?" We now present 5 easy steps to construct and use statistical control chart methods.

They are:

1. GATHER DATA
2. COMPUTE SUBGROUP AVERAGES AND RANGES.
3. CALCULATE CONTROL CHART LIMITS AND CENTER
4. PLOT AVERAGES, RANGES, CENTER LINE AND LIMIT LINES
5. INTERPRET CHARTS

GATHER DATA/COMPUTE AVERAGES AND RANGES

In the last issue of ATVQ we learned to construct subgroups by taking repeated measurements of the same standard video signal in groups of five repeats every day for six days. Thus we constructed 6 subgroups of n=5 each. We then computed the average $\bar{x}$ for each group by $\bar{x}$ = Sum x/n. Instead of calculating the standard deviation as in part 1, we will determine the range R of each group by R = highest - lowest. Table 1 on the next page reproduces this data showing both average and range for each subgroup from part 1.

MEASUREMENT		GROUP1	GROUP2	GROUP3	GROUP4	GROUP5	GROUP6
1		98	95	98	102	95	98
2		100	100	102	102	95	102
3		98	98	98	102	98	95
4		95	102	95	100	98	102
5		100	100	92	98	98	105
Average	$\bar{X}$	98.2	99	97	100.8	96.8	100.4
Range	R	5	7	10	4	3	10

TABLE 1
RAW DATA and STATISTICAL COMPUTATIONS for 6 SUBGROUPS

Six subgroups are not enough to compute valid limits for control charts. It is recommended that 20 to 30 subgroups be used. Therefore we need to create 15 more subgroups or 5 repeats each for a total of 20 subgroups or 100 measurements as seen in table 2.

		SUBGROUP									
MEASUREMENT		1	2	3	4	5	6	7	8	9	10
1		98	95	98	102	95	98	95	105	98	105
2		100	100	102	102	95	102	105	102	98	100
3		98	98	98	102	98	95	100	102	105	98
4		95	102	95	100	98	102	98	95	98	95
5		100	100	92	98	98	105	105	100	102	98
Average	$\bar{X}$	98.2	99	97	100.8	96.8	100.4	100.6	100.8	100.2	99.2
Range	R	5	7	10	4	3	10	10	10	7	10
		11	12	13	14	15	16	17	18	19	20
		100	105	95	98	100	100	102	98	105	105
		102	102	95	102	95	105	98	102	102	98
		100	95	105	95	98	92	98	100	100	98
		100	100	98	100	100	105	98	98	100	100
		105	95	98	98	98	100	102	102	98	105
	$\bar{X}$	101.4	99.4	98.2	98.6	98.2	100.4	99.6	100	101	101.2
	R	5	10	10	7	5	13	4	4	7	7

TABLE 2
STATISTICAL COMPUTATIONS for 20 SUBGROUPS

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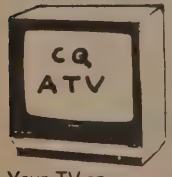

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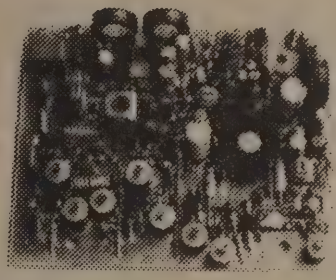

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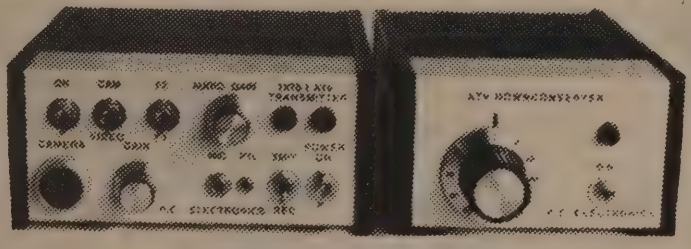

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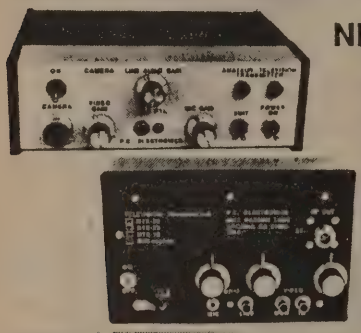
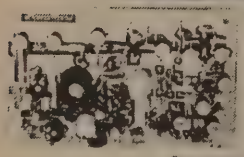


NEW 1 WATT TV TRANSMITTERS for 33 & 23cm...$299

TX-33 for the 902-928 MHz band and **TX-23** for the 1240-1300 MHz band. Specify frequency: 910.25 simplex or repeater input, 1289.25 simplex, 1277.25 repeater input are most common. Novices now you too can get on ATV with the TX-23. > 1 watt p.e.p. with adjustable blanking pedestal for proper setup with Downeast amps. Built in T/R relay with BNC output to same band TVC- xG downconverter. Independent controls for mic and line audio. Push to look. 10 pin VHS camera connector plus video & audio input RCA phono jacks on back for any other camera, camcorder,VCR or computer video switch selectable from the front panel. Video monitor output has actual detected modulation in transmit for accurate adjustment of video gain, & camera video in receive. Req. 13.8 Vdc @ .5A. + camera current. 7x7x2.5" shielded cabinet. **RTX-33** & **RTX23** versions in dicast aluminum box without T/R relay also available.



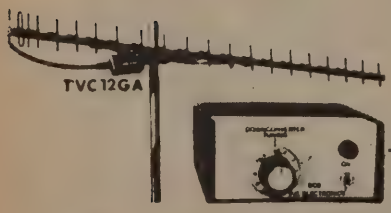
TXA5-33 1 WATT ATV TRANSMITTER BOARD.....$139
This wired and tested 33 cm board is for those who want to package their own system. Requires FMA5-E ($39)for sound subcarrier &13.8Vdc @ 500mA. 3"x5".
TR-23 module gives low loss T/R antenna switching between TXA5-33 & TVC-9.**$29**

DOWNCONVERTERS FOR 33 & 23 CM:

TUNEABLE READY TO GO in 4x2.5x7 shielded cabinet with 120Vac to 12Vdc wall plug power supply. All our downconverters have GaAsfet preamp and mixer.
TVC-9G 902-928 MHz to ch 2, 3, or 4.....**$99**
TVC-12G 1240-1300 MHz to ch 7 or 8....**$109**

CRYSTAL CONTROLLED in dicast aluminum box, requires external 11 to 15 Vdc.
TVCX-9 specify input 33 cm frequency and output on CH 3 or IF.... .**$139**
TVCX-12 specify input 23 cm frequency and output on CH 8 or IF.....**$159**

WIRED AND TESTED BOARDS for those who package their own systems or antenna mount TVC-9 in a water proof enclosure with one of our DCD boards ($8) to power and tune through single coax from our DCB control box ($59) at the shack.
TVC-9 varicap tunes 902-928 MHz to open channel 2, 3, or 4 in your area **$59**
TVCX-33 crystal controlled specify 33cm input and CH 3 or IF output freq...**$109**
TVCX-23 crystal controlled specify 23cm input and CH 8 or IF output freq. ..**$129**



TVC-12GA ANTENNA MOUNTED GaAsfet 23CM DOWNCONV.....$109
Dicast aluminum boxed version of the TVC-12G, mounts at antenna to save feedline losses. Powered & tuned with 10-18Vdc thru output 75Ω coax from DCB control box at the shack.
DCB Control Box, also contains IF amp for driving both TV & VCR tuner.....**$59**

TONNA 20923 33CM YAGI ANTENNA 23 ELEMENT 16.3 dBd.....**$67**
8.3ft boom. 50-ohm type N male cable.

TONNA 20623 23CM YAGI ANTENNA 23 ELEMENT 16.3 dBd.....**$67**
5' 10" boom. 50 ohm type N male cable.

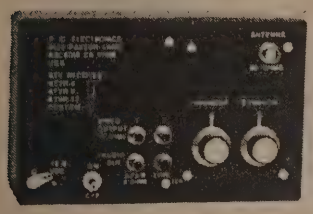
ATVR-x ATV RECEIVER ready to go in dicast aluminum box use for link or repeater. Outputs: 2 composite videos to drive monitor and transmitter, adjustable squelched line & speaker audio. 13.8Vdc @ .3A. Contains TVCX-xx xtal conv and VRC45 45.75 MHz IF/receiver ($99) modules. Specify: **ATVR-4** input on 70cm....**$299**
ATVR-9 input on 33cm...**$309** **ATVR-12** input on 23 cm band...**$329**

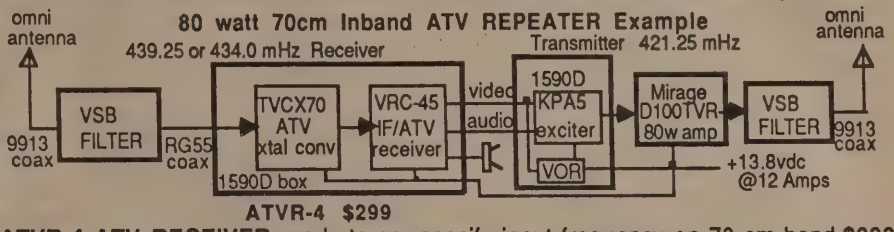
5/89

P.C. ELECTRONICS 2522 PAXSON LANE ARCADIA CA 91006-8537 USA
TOM (W6ORG) & MARYANN (WB6YSS) O'HARA (818) 447-4565

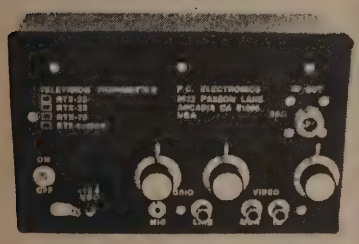
BASIC ATV REPEATER or LINK SYSTEMS

Package your own 80+ watt inband repeater system using the modules listed in the block diagram below or go crossband by connecting up the RTX-33 or 23 transmitter and ATVR-x receiver. Crossband saves one 70cm channel for simplex and enables seeing your own video coming back. 33 and 23 cm omnis are available from NCG Co. [call Bruce: (714) 630-4541] and linear amps from Downeast Microwave [call Bill: (207) 948-3741]. Best performance is with the repeater input on the lowest band. Low loss vestigial sideband filters are available from TX/RX Systems [call Jon: (716) 549-4700].





ATVR-4 $299



ATVR-4 ATV RECEIVER ready to go, specify input frequency on 70 cm band.**$299**
Outputs: 2 videos, adjustable squelched line & speaker audio. 13.8Vdc @ .3A.
Contains TVCX-70 xtal conv ($99) and VRC45 45.75 MHz IF/receiver ($99) modules.
ATVR-9 input on 33cm...**$309** **ATVR-12** input on 23 cm band...**$329**

VOR-2 VIDEO OPERATED RELAY. Detects horizontal sync to key repeater...**$45**
Has 10 sec signal dropout delay and 9 minute continuous signal external video ID timers. Also great for home station auto ID. Use with Elktronics VDG-1 video IDer and color bar gen board, both fit in Hammond 1590D box. Contact Bill WB8ELK directly for more info and purchase of the VDG-1 ($89) at (419) 422-8206.

RTX 1 WATT REPEATER OR LINK TRANSMITTERS FOR 33 & 23 cm.$299
Specify **RTX-33** (923.25 typ.) or **RTX-23** (1253.25 typ.) frequency. 13.8 Vdc @ .5A matches Downeast amps. Video and audio adjustable inputs, monitor video out.

***NEW* UNIDEN VM200 BLACK & WHITE CCD TV CAMERA / MONITOR / INTERCOM SYSTEM.....$259**
Use as low cost repeater site or home security/intercom system, or on ATV as an ID camera. Runs on 12 Vdc, AC adaptor included. Connect to home VCR for security application or to your TC70 (or any of our transmitters) for ATV. 4.8" monitor. Camera CCD has19440 Pixels, size is 4.8x4x2.2" - might be small enough for larger R/C models.

KLM BROADBAND ANTENNAS FOR ATV

440-6x

KLM 440-6X has 8.9 dBd gain, vertical or horizontal polarization rear mount on a short 28" boom. Ideal for point to point, fixed at a repeater or small enough to be portable at public service events to minimize multipath ghosts and get some gain at the same time. Wide 60 degree beam width. **$51del**

KLM 440-10X has11.2dBd, 64" boom. Rear Horiz or Vert mount same as 440-6X, just longer for a little more gain and mulitpath rejection.....**$65del**

***NEW* KLM 440-16X** replaces the 440-27 - same 12 ft boom length and full 70cm bandwidth but more rugged . Measured more than 14 dBd at 1989 West Coast UHF Conference. As with all 3 KLM antennas the 50 ohm balun is included, type N female connector.....**$119delivered**

ATV antennas must have broad bandwidth in addition to high gain and low VSWR. Few other antennas work well at both 439 and 421 mHz. The three KLM antennas listed here fit the requirement and have a long history of rugged operation with ATVers. The gains listed have been proven out at VHF/UHF conference antenna measuring contests, they are not marketing hype. All KLM antennas listed here take up to the maximum legal power limit. Balun or matching network with female type N connector included. Price includes UPS surface shipping anywhere in the contiguous USA.

AEA 450 ISOPOLE OMNI 4 dBd GAIN ANTENNA. 50 ohm type N female feedpoint. DC grounded...**$89del**
High efficiency decoupling cones puts all the RF on the horizon where it counts. Mounts on 1 1/4" dia masts. Works great for local ATV or FM simplex roundtables, portable/ public service/ Kreepie Peepie system, & repeaters.

del=delivered via UPS surface shipping in cont. USA.

July 89.

The w6ORGy Notes

By Tom O'Hara, W6ORG

What happened to the ATV Q & A column? Well I have gone back to a more general format that I used to write in many years ago which will include your questions but elaborate more in general on technical topics as well as my personal views and observations. I found that most of the questions I answered opened up the subjects for more questions. The Feedback section was longer than the Q & A section.

The w6ORGy Notes started over 20 years ago when I was active in the So. California ATV Club and began a small ATV newsletter for the group. ORGY was a nick-name given to me by someone over the air that stuck. It comes from saying the last 3 letters in my call fast, not my other hobby (in my fantasies maybe).

WHAT'S THE BEST ANTENNA FOR 70CM ATV THESE DAYS?

The best one is the biggest array up as high as possible that you can afford. There are some new ones on the market which hopefully will be measured at one of the UHF Conferences so you can make a best informed comparison.

I have included the results of this years contest, tnx to Joe Burke WA8OGS, held at the Dayton Hamvention elsewhere in this pearl of ATV wisdom. Both AEA and KLM had new 70cm beams, but were not able to have them measured (or maybe they wanted to make sure of the advertised claims first, HI HI)

Mike Lamb of AEA said he would try to have it measured at the Central States UHF Conference in Rolling Meadows IL July 27-30. Hope quite a few of the Midwestern ATVers attend and bring some antennas. Contact Chuck Clark AF8Z at 4N560 Powis Rd W, Chicago IL 60185 for more info.

The New KLM 440-16X was measured at the West Coast UHF Conference in May at over 14 dBd. It was calculated out to be 14.2 which is within the ballpark.

KLM has come out with this antenna to replace the 440-27. Cost of aluminum has been shooting up, and they could not hold the price on the antenna with the cost of materials and manufacturing. They started with the redesign of the 6 and 14 element broadband antennas (6X and 10X) and now the 16X.

This antenna is more rugged with a 1.5" two piece boom and thick folded dipole driven element. The balun is made from RG303 double shielded silvered Teflon coax with a female type N at the end. But like everything else, the price is a little higher. The shipping box is a little too large for the UPS normal 8 lb cost, and has to go at the oversize 25 lb rate. We have the 440-16X for $119 delivered. I do not know what the price for the AEA beam will be.

Rutland Arrays is advertising an ATV version of their FO-22-432. Claimed gain is 15.8 dBd, which should be close judging from other K1FO antennas I have seen listed at the contests, and with a boom length of 14 ft. The boom diameter is 1". Bandwidth is not listed but the VSWR over the range of 422-439 MHz is stated at <1.4:1. Anyone have one and measured the gain at 421 and 444 MHz? VSWR is not a direct indication of gain bandwidth. Price is listed at $88.95 plus $5 or $7 UPS. Contact them in the evening between 7-10 pm EST at (717) 774-5298.

WHAT'S NEW WITH HORIZONAL OMNIS?

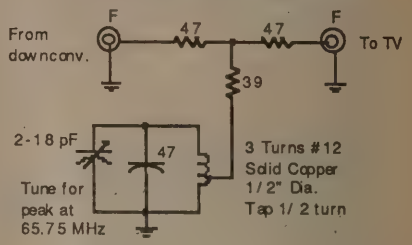
Dave Clingerman, W6OAL, is producing some big wheel antennas of which he had a single one measured at Dayton with about unity gain. He has a 4 bay big wheel with a double stub tuner but it was too large to easily transport, maybe he can get it to Central States?

Dave also has some log periodics and folded dipoles with reflectors for sale. He showed the single big wheel at the Dayton ATV forum Saturday afternoon, and it looked nicely made.

Contact Dave at 4725 W. Quincy, Denver CO 80236 or call (303) 7985926 for prices and details.

Also at the forum I had Lindsay antennas show their horizontal omni they have been selling for the UHF LPTV market. They scaled one for 70 cm and brought it to the show. This is the first commercial horizontal omni antenna that I have seen that doesn't cost an arm and a leg. In fact it is about what the vertical ones cost..$500. It might be the answer for those ATV repeaters who's site managers and owners demand commercial antennas, or for those with more $$ than time or ability to build one.

ATV SOUND PEAKER



Here is a simple way to boost the receive level of the sound subcarrier where it used to drop out when the video got a little snowy. It might also help those TV sets that have the best picture vs best sound problem.

What this is is a 12 dB 75 ohm resistive T attenuator with the bottom of the T going through a high Q parallel tuned circuit set for the sound subcarrier frequency as it comes out of your downconverter on channel 3.

Off resonance, the bottom of the T (39 ohm resistor) goes to ground through a little inductance of the 1/2 turn of the coil. But at resonance this impedance goes way up which puts the 39 ohm resistor out of the picture (pun intended) leaving just the two 47 ohm resistors in series to attenuate the signal. Instead of 12 dB insertion loss at resonance, I measured 7 dB or a boost of 5 dB over the video carrier, almost doubling the equivalent distance of the signal.

The greater than 25 dB gain in the PC GaAsfet downconverters should be more than enough to over come the insertion loss of this sound peaker, but if not a Radio Shack booster (15-1118 or 15-1117) placed between the peaker and TV will compensate.

To use, tune in an ATV picture that has some snow in it, but not below color dropout. Fine tune the downconverter for best picture. Then slowly tune the trimmer cap to peak the sound. You will find that the color can be peaked also and in some cases shifted a little depending on the tank Q and tap point.

The circuit must be put in a shielded enclosure. I used a good quality air variable (E. F. Johnson 160-110) and NPO parallel cap. Silver micas are also good. Keep resistor lead lengths short.

Let me know how it works out for you, I may make it available ready to go.

WHAT DO YOU THINK OF AEA'S NEW TRANSCEIVER AND WHAT AFFECT WILL IT HAVE ON PC?

I heard this a lot at Dayton and Arlington, and discussed it briefly at the ATV Forum. It's a fair question with a lot of future impact not only on me but the ATV mode.

SOME HISTORY

It is no secret that AEA approached me to buy me out a year ago last January. They have done well with their packet products and were looking to expand. Mike Lamb's (prez of AEA) kids were probably the most influence as ATV seemed the biggest incentive to their getting a license. I still think this is an under emphasized mode by the ARRL in their efforts to bring young people into the hobby. After all they are the video generation.

I agreed to AEA's price and thought the deal was 99% done except for a few details and formalizing the sales contract. One of the conditions was that I would have about 6 months to sell off existing inventory. Since ads take about 3 months before they come out in a magazine, and the deadline was now, I committed to a Spring Sale at a good discount. AEA decided to design their own instead and told me the deal was off in early March. They thought they could have one ready for the ARRL National in Portland that September and even advertised it that month.

The difficulties and considerations of designing an ATV transmitter using basically the TV RF modulator, SAW filter, and transverter method appeared two issues ago in ATV Q & A. AEA found the same things out and didn't come out with the first units until a year after they started.

I got hooked on ATV over 25 years ago after seeing a demo at a local radio club and with missionary zeal, started writing, designing circuits and promoting the ATV mode. From other hams requesting PC boards of the circuits (hence P. C. Electronics - before Personal Computers) it grew into a full time business 12 years ago.

I never have been able to make the complete transition from hobbyist to businessman, so I do a lot of free testing and design suggestions even to would be competitors to promote my favorite mode.

THE RIG

I was sent an AEA FSTV-430 and also Bill Brown brought over one that he was sent, to test out just before Dayton. Also see the review in the July issue of 73 Magazine. I was very much disappointed in these first 2 units but should not have been surprised for someone's first try at ATV. I passed all the test data and my suggestions to AEA, and said that frankly they had just not done their homework from both an engineering standpoint, and not knowing the ATV practices around the country.

Originally the price was going to be near my TC70-1. But it turned out over $100 more with no worthwhile differences and some deficiencies, in my view, that would warrant my phasing out the TC70-1 and selling their transceiver.

The sound subcarrier was only 5 kHz deviation instead of 25 kHz and drifted 10 kHz in just 5 minutes.

The video was clamped to white level instead of the usual black or blanking level as is standard broadcast practice.

Downconverter conversion gain was only about 10 dB and most TV's today need at least 15 to get to the noise floor (mine have 25-35). The receive tuning pot and switch was of poor quality and was broken.

There is no monitor video at the 10 pin camera connector and the monitor video is just what is coming out of the channel 3 modulator rather than detected at the antenna .

The video was not what I consider VSB by the time it got through the final amp. The LSB sound was only reduced about 14 dB, which is some help in the case of close by interference problems but dangerous if a person tries to use it on 421.25 - chances of jamming hilltop government repeaters below 420. But the biggest deficiency was no information on setting up the FSTV-430 to drive an amplifier.

AND THEN ON THE HORIZON..

Well just before sending in this column, a modified AEA transceiver shows up in the nick of time. I did not have much time to really wring it out on the bench in detail but it is much improved.

The SAW filter on the downconverter output has been removed resulting in a conversion gain now of 26 dB. This filter was unnecessary since most all TV sets have one in the IF, and it came after too many stages to help much in the way of off channel strong signal overload.

The sound subcarrier now has the full 25 kHz deviation and sounds good. Subcarrier injection was set to -15 dBc which will go 1.5 times farther than the nominal -18 dBc the TC70-1 is set for. The 4.5 MHz frequency was still off and drifts - measured 18 kHz high and went down to 12 kHz high after 5 minutes. The IM component has been much improved which resulted in a triple beat down more than -45 dBc. What this means is that even though the sound subcarrier is not right on 4.5 MHz you cannot see the cross hatch interference in the color video. However you will see it if you add an amp that is not extremely low in IM or driven properly.

It looks like a lot of work was done on mix product filtering and on the final for linearity and intermod. Besides the triple beat being down, the LSB IM components were also reduced. The LSB sound was down -34 dBc and the color -45 dBc. The sideband harmonics were also now well below -50 dBc. This reworked unit also did not have the channel 3 mix with LO products like the first time around. It went from -35 dBc on the LO +/- ch 3 and output + ch 3 (might have been significant interference to the neighbors on channel 18) to better than -50 dBc.

Power out was still just a hair under 1.0 watts p.e.p. and sagged to .8 after 10 minutes of continuous operation. The AEA engineer said that it should be tuned up for no more than 1 watt to stay below the final compression point as should be done with any linear amp with AM modulation.

The video is now clamped to the sync pulse. This is a lot better than white level but still there are no instructions on how to drive an amp or to compensate for it's compression. If there was an overall RF power out control you could vary it to drive any of the Mirage ATV amps safely to 1/2 p.e.p. rating without significant sync compression. There is no conventional sync stretcher or pedestal clamp, however there is a control on the board to distort the whole video waveform like an inverse log function but it would be difficult to set up without a detector on the amps output connected to a scope.

While AEA's transceiver has great value to ATVers who have interference problems with other mode users in the 70 cm band who are close by, putting a Mirage amp on after it can put you back to the same level as if you had a DSB unit. The LSB levels if used at 421.25 MHz would be strong enough to give government repeaters in the 406-420 segments fits. It may be that is the reason AEA has no instructions on how to drive an amp and are developing their own to match it.

FUTURE SHOCK

As Mike Lamb predicted to me last September, their entry into the market would increase my sales. And it has, the TC70-1's are up 10% in the same six month period from November 87 to 88 (I owe him a dinner). ATV's big growth is just beginning as I see it. I think my sales growth has been limited in the past by the number of hams with cameras and the few number of pages in the major magazines showing ATV in a positive light. AEA has a lot of slick full page color ads and a full time marketing department that will reach many more hams with the idea that ATV is fun and easy to get on. The more rigs out there, the more people will write up their experiences and applications.

AEA sells through dealers which will reach those hams that just have to tweek the knobs or see it in the major ham dealer catalogs or have a salesman talk them into it before they will buy it.

I have not, until now, gone through dealers to keep the transmitters out of the hands of commercial and illegal users. I get about 3 calls a day from security companies, police departments, robot manufacturers, and a wide range of non-amateur concerns wanting to buy a transmitter without care as to being legal or interfering with hams. I verify every call in the Callbook before shipping a transmitter, but I don't expect many dealers will take the time or have the inclination do the same. You may have to polish up your hidden transmitter skills.

WITH THE SLIGHT CHANCE THAT THE LEAGUE CAN OVER TURN THE FCC DECISION ON APPEAL, 220-222 MHZ IS HISTORY. WHAT AFFECT WILL IT HAVE ON ATV?

This means that all those control, links, and remote bases will be making a mad scramble to relocate on 70cm. If you are not in good with your local Frequency Coordination committee now, you may be in for a lot of interference problems.

Most frequency coordinators have had to be drug screaming and clawing from FM repeater record keeping into spectrum management for the whole band. And, unfortunately, ATVers don't get involved until crystals are bought and the rigs installed on hilltops are turned on.

If you wait for that, it won't be one or two transmitters to recoordinate, it will be those plus all those relocating from 220 in addition. Also new on the scene are the higher baud rate packet links.

The other guys would have us move up to the next higher band...you could say the same to them, but the higher you go the greater the path loss (2 times frequency 1/2 the distance all else being equal - 6 dB) and the more expensive the gear.

Even without experiencing actual interference some say ATVers need to use VSB filters to maintain a 70 cm frequency. Do you want to spend a minimum of $150 for a filter that has at least 2 dB of insertion loss unless it is necessary at your location? You might be able to say you are VSB with the new AEA unit but not with an amplifier connected. To get true VSB the filter needs to be in the antenna line.

The answer is to get representation in your frequency coordination committee among all mode users and come up with an agreed to band plan and coordination policy on a technical basis.

In Southern California, we have over 250 ATVers and the 70cm band has been full since 1980. We coexist with 434 and 426.25 ATV with all kinds of other mode users and only a handful have had to go to VSB when interference to weak signal or Satellite users in their neighborhoods was noted.

Along those lines here are some pros and cons to consider when determining the plan for your area. Only 2 frequencies can be used for ATV without a high probability of mutual interference as well as plenty of space for other modes. The choice must also be made between an inband repeater with simplex shared on the repeater input or output, or a repeater input with crossband output and a simplex channel.

421.25

This is most used output for repeaters and requires a VSB filter in the antenna line to keep sidebands and final generated intermods from interfering outside the amateur band below 420 MHz. The channel occupies 420 to 426.0 MHz and corresponds to cable channel 57. Listed in ARRL bandplan for ATV repeater or simplex, but shared with control links and experimental.

FM or packet links, control, etc. can then use 426.0 to 431.0 with 3 MHz channel splits. This gives 80 duplex 25 kHz channels and 40 simplex channels or less combinations with some multiple adjacent channels used for higher baud rate or voice fidelity. FM should take advantage of CTCSS to prevent occasional noise squelch breaks from all sources.

426.25

This is the most popular simplex or secondary channel. Half of all our transmitters sold to date have had this frequency requested. There has been least interference noted on this channel in the lightly populated areas.

Most used by R/C modelers, robots, and special purpose video links.

Suggested as a good crossband repeater input, however other mode users at the bottom of the band should be high in low out near the same site to prevent overload.

Occupies 425.0 to 431.0 MHz. Other modes have the same number of 25 kHz channels as listed above but between 420 and 425 MHz. Channels at 421.75 and 422.67 +/- 200 kHz (32 NBFM channels out of the 80 possible) should be assigned last when all others have been filled, and only at which time VSB filtering would be required of those having enough LSB color or sound subcarrier power to actually cause interference. CTCSS strongly recommended.

427.25

Used in a few areas instead of 426.25 because it corresponds to cable channel 58. Listed in ARRL band plan solely for ATV simplex, not shared. However, 426.25 was preferred to minimize possibility of the 427.25 sound subcarrier at 431.75 from overloading any near by 432.0 weak signal or EME receivers. Occupies 426.0 to 432.0.

Would give 40 more 25 kHz channels (total of 120 from 420-426 MHz) to other mode users to use as duplex or combination with simplex links. LSB last to assign and require VSB frequencies would be 422.75 and 423.67 +/- 200 kHz. Use of CTCSS recommended.

434.0

Occupies 432.75 to 438.75. Most popular switch to frequency when local FM repeaters fill in below 444.0 in areas using 439.25. 433.25, cable channel 59, would have been the logical choice, but weak signal users were concerned about sideband energy at 432.0. Experiments showed most energy down 40 dB and random at any one spot frequency 2 MHz below rather than 30 dB 1 MHz below video carrier.

Packet links would located between 438.7 and 440.0 MHz instead of 433 to 435 MHz

The LSB other modes avoid frequencies til full and require VSB for those experiencing interference are 429.5 and 430.42 +/- 200 kHz. USB sound is at 438.5 and color at 437.58. I am not aware of any satellites using this 437 frequency as yet, but the color is usually -22 dBc.

Experiments with satellite users showed no interference at 435 MHz except for one within a mile with beams pointed right at each other. However satellite uplink stations greatly interfere with video down to -40 dBc. Since satellites are not in view for very long, the convention is when the video gets hit with uplink signals, shut down the video for 15 minutes and come back later when the pass is over.

Alternately if the video is important, like a public service event, etc., known 2 meter calling frequencies are used to work out a temporary schedule on a gentlemanly basis. In Southern California the Satellite users are on 144.144 USB, weak signal operators on 144.170 USB, and ATVers on 146.43 FM.

Likewise if there is a UHF contest we give up ATV for that weekend, and in fact we get on and give the contesters some points.....helps change their attitude about sharing the band. They stay off during the Rose Parade and some of the other public service events the local ATVers do.

439.25

Occupies 438 to 444.0 MHz and corresponds to cable channel 60. Most popular frequency east of the Rockies where UHF FM repeaters have not filled up the 40 25 kHz channels from 444.0 to 445.0.

It is the only frequency available to those in Canada or above the A line per the ARRL band plan. Some have used 434.6 DSB or 434.0 VSB in Canada. Also some repeater inputs have favored the lower VSB instead of the upper, when unable to get FM repeaters to stay above 444.0. The LSB color and sound subcarrier frequencies in this case are 435.67 and 434.75 MHz.

439.25 is listed as an ATV repeater input in the ARRL Repeater Directory 70 cm band plan. However 442-445 is also shown as FM repeater inputs or outputs. This is incompatible as FM will tear up a video signal if below 444 and a video signal will interfere with FM if on 442.83 or 433.75 +/- 200 kHz, the color and sound subcarrier frequencies. But this is what you get when ATVers do not take an active and technical part in the band planning and spectrum management.

Optimum FM repeater offset would be low in and high out to keep any nearby or at the same site FM transmitters from overloading the ATV repeater receiver, even with a good VSB filter. Since there is likely to be so few ATV repeaters in any given area, those FM repeaters closest or at the site should be placed as high in the band as possible. Use of CTCSS is recommended.

I GOT INTO ATV TO HAVE FUN, NOT GET INTO SQUABBLES AND FIGHTS OVER FREQUENCIES.

Sure we all did. But then if all users of the 70cm band don't get together and work out an amicable bandplan it turns into interference wars in which nobody has any fun.

Talk to your local ARRL Director about the good ATV does for public service events and emergency operations. Ask him about the individuals and policies of the local frequency coordination committee. He may have some insights and smooth the ways for you. Then contact the 70 cm coordinator and offer your services and willingness to help. It may take some time to overcome prejudices and preconceived ideas about ATV and ATVers. But it can be done if you stay calm, cooperative, and hang in there.

The way to attack it is to point out that there is plenty of spectrum for all if it is allocated on a technical basis, and your willingness to make on the air tests and work out solutions.

You can also point out the number of channels available without interference in the FM portion of the band.

You can let all know your two meter ATV calling frequency to solve individual interference problems with the 432 DXers and satellite users. And to both, also point out the fun of integrating ATV into their stations to see shuttle video, weather radar, show schematics, construction

projects and sharing their tips on UHF techniques.

To the FM repeater owner there is using a remote camera for site security. This has worked as a way to get space for an ATV repeater at some of the best sites.

HOW ABOUT POINTS FOR ATV ON FIELD DAY, THEY DID IT FOR PACKET?

Bob Bruninga, WB4APR made a good point to his ARRL Section Manager on this subject, that also deserves your support.

Packet contacts got bonus points at Field Day to encourage it's development for emergency/portable capabilities.

Is not ATV in the same boat? It is used more and more for remote visual damage assessment, weather watch, public service events, etc. to transmit live video from camcorders in the field to command posts and EOC's.

Bob suggests 100 points for a two way video exchange, 10 for each additional two way video exchange, and 2 points for each additional video reception report.

What do you think? Write now to your ARRL ARRL Director. A copy to your ARRL Section Manager, QST Publisher David Sumner K1ZZ and the ARRL contest manager wouldn't hurt either.

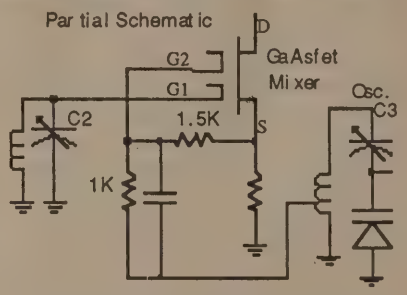
HOW CAN I FAVOR THE LOWER VSB WHEN RECEIVING A DSB ATV SIGNAL AND THE INTERFERENCE FROM FM REPEATERS IN THE UPPER VSB IS UNBEARABLE?

This is also an alternative for Canadian ATVers and those above the A line using 439.25 MHz.

ATV converters have the local oscillator (LO) on the low side of the input frequency. This maintains the sidebands the same as transmitted.

To invert the ATV sidebands the ATV downconverter just has to change it's LO to the high side. In the case of 439.25/ ch 3 it goes from 378 MHz to 500.5 MHz.

In the P. C. Electronics tuneable downconverters it is a little more than a simple matter of tuning the oscillator cap toward minimum capacity to change the frequency. On some of the GaAsfet mixer versions the oscillator may drop out before it reaches 500 MHz. In this case the mixer gate 2 bias resistors have to be changed to lower values: source to gate 2 changes to 1.5K from 3.3K and the one in series to the LO to 1K from 2.2K. Replace and solder in one resistor at a time to reduce chance of static charge build up on gate 2 blowing the GaAsfet.



Tune in a strong ATV DSB picture as you would normally. Then just tune the oscillator trimmer cap C3 slowly and carefully with an insulated tuning tool toward minimum capacity until the signal reappears. Do not touch the preamp trimmers as they are unaffected by the change.

You will find that the varicap tuning range has gone from 40 MHz to 20 MHz and you may not be able to reach as low as 421 MHz. Try setting the oscillator trimmer cap to tune 439.25 at 8 on the dial and then see if the other frequency comes in lower on the dial.

For crystal controlled downconverters you will need a new crystal and the multiplier chain tuned circuits changed for a different multiplier. If used with a VSB filter, as is the case with a repeater receiver, the filter will have to be retuned to favor the lower VSB.

Just to confuse you, TV receivers have a SAW filter in the 45.75 MHz IF that passes the lower VSB. The LO in the TV sets mixer is on the high side of the channel it is tuned to, which inverts the sidebands. Channel 3 video carrier at 61.25 then mixes with the high side LO at 106.5 MHz giving the difference frequency of 45.75. The sound subcarrier for channel 3 is above at 65.75 MHz which gives a difference frequency, when mixed with the 106.5 MHz, of 40.75 MHz in the IF, or on the low side now, of the video carrier.

WANT THE SOUND TO GO FARTHER IN LESS THAN SNOW FREE CONDITIONS?

You can crank up the sound subcarrier injection but there is a price. You can change the 470 ohm resistor that feeds the emitter of the 2N2222A modulator transistor in series with the 470 pF disc to 220 ohms.

However since the final and any following amps have the same p.e.p. compression point, the sync tip has to be reduced a corresponding amount. Actually the amount of sync reduction is less than a dB for 3 more dB of sound subcarrier injection. To do this a 270 ohm resistor is placed in series with the 1N914 and 33 uH RFC in the sync stretcher output (collector 2N2907) to the modulator.

The TC70's produced after July 89 have variable sync stretching as well as more sound subcarrier injection and a deviation control.

The modulated final must also have the base biased to keep the color and sound intermod (triple beat) from rising too high from the increased sound injection. If your PC transmitter does not have the MRF555 biased (check bottom of board also for a resistor to +) then change the base to ground resistor to 47 ohms, and the base to +13.8V to 1.5K. This is a worthwhile change even without the sound increase for less IM and triple beat.

CANT GET RID OF ALL THE SYNC BUZZ IN YOUR ATV TRANSMITTER YOU PACKAGED YOURSELF? VSWR LOOKS OK ON THE METER BUT RF STILL SEEMS TO BE FLOATING AROUND?

The most common error made by those packaging up their own UHF gear is the RF coax connection inside the chassis. I have seen some long pigtails from the coax shield connected to a solder lug inches away.

The best way to visualize it is to consider that a tuned circuit at 70cm often uses a wire only 1" or so long. Therefore your shield pigtail is like putting an RF choke in series with it to ground. RF will then float back down the braid to the board and radiate who knows where inside the box. Most likely it will get into the mic preamp and rectify, causing sync buzz.

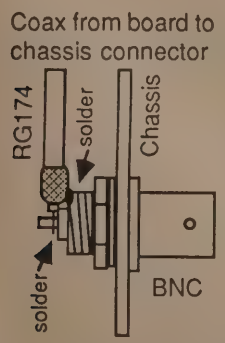
It will not show up on your power meter as it reads power between it and the load, not if there is an impedance bump or RFC between it and the transmitter.

Most use a BNC or type N chassis connector. This goes not only for transmitters but for receivers also. The coax braid should be as close as possible to where the current goes into the shield of the connector shell. The center conductor should not be out of the shield for more than 1/4".

Pretin the coax connector shell with a heavy iron after tightening down the nut. It helps to rub the iron back and forth on the shell to keep the metal free of contaminants. Check with a pic to make sure the solder had adhered to the shell.

Strip the outer insulation back 1/4" and fold back the braid over it. Strip the dielectric about 1/8" and pretin the center conductor and let cool. Pretin the braid at the point of intended contact with the connector shell. Make sure there is no bending or stress on the cable that might melt through and short.

Solder the center conductor first and let cool, then quickly solder the braid to the shell at the pretined point. Again do not bend the coax when soldering. Check for shorts.



WHAT ARE THE SPECIAL CONSIDERATIONS FOR USING ATV IN R/C MODELS?

The biggest problem is keeping the strong 1 watt ATV signal from desensing the R/C control receiver. R/C receivers are not made for being placed right next to a strong RF field, in fact most of them are unshielded and have little front end selectivity.

The receiver should be shielded with copper foil or sheet. The receive antenna must be routed as far away from the transmitter and its antenna as possible.

Probably the simplest and most effective is a 13" vertical dipole mounted in the tail fin. RG 174 coax is then run out as far as possible at right angles to the front of the tail fin, then down through the empennage to the transmitter.

The transmitter also must be shielded and kept away from all the other electronics.

At the receive end, a vertical omni can be used for close in, but a 440-6X small beam works better to minimize multipath ghosts and at distance.. It has a 60 degree beam width.

A crystal controlled downconverter might be preferred over the tuneable since there will probably be some temperature changes during the operation, and it will be one less thing to tweek.

You can legally run up to 1 watt for a one way remote control operation. The TXA5-5 at 80 mW is fine for up to 1/2 mile line of sight, and the KPA5 for non line of sight or any thing farther. Some use the sound subcarrier for sending data back to the ground.

I may be making a special transmitter board for R/C applications that conform to the 2 1/4 x 4" size used in rockets. Bob Rau, N8IYD, cut down one of my TXA5-5's to fit, but wants more power for his 100" long rocket. It was an interesting show and tell plus video tape at the ATV Forum in Dayton he gave.

The camera should be one with a solid state pickup device. The old style with vidicon tubes can get a permanent burn if accidently pointed at the sun.

Small and light color cameras are still very expensive in the $500+ area. Some black and whites with low light level are not much less. However I now have the Uniden black and white security camera/intercom/monitor systems that are supposed to have just the cameras available soon for under $200. These are not high resolution or low light but do quite well outdoors and you can better afford to crash 2 or 3 compared to the fancier ones.

NEW DOWNEAST 23CM DUAL POWER MODULE AMP GETS 35 WATTS P.E.P.

I tested out the first amp from Bills bench with my TX23 just before Dayton. It worked great taking only .8 in to get the full 35 out. The cost of the Mitsubishi power module amps is less than the discrete ones he produces and are very linear. I am now waiting anxiously for the 70 watt 4 module amp.

NEW VIDEO OPERATED RELAY/ID TIMER

Rick Nims, N6ZT, sent me a note about some modifications he made to the old RCM-3 ATV repeater control module to keep it from keying up in the presence of strong radar pulses which they have at the Sulphur Mountain repeater.

I was about to reorder more of the VOR boards, but instead thought I would redesign it to add a longer key up delay to prevent radar or other interference from falsing the transmitter on. The VOR-2 is now available.

At the same time I made the transmitter stay on about 10 seconds when the received video is dropped and another relay switches to an external video ID source (an ELK board of course). But to fulfill the whole ID requirement I put a 10 minute timer that keys the ID in for about 3 seconds every 10 minutes if keyed continuously for the long winded (or is that long sighted).

So besides repeater and link applications, any station could use it to automatically ID, or remotely key the transmitter by turning the almost instant on solid state cameras we have today.

73, Tom O'Hara, W6ORG
Send me some photos
New FAX line (818) 447-0489

ANTENNA RANGE DESCRIPTION
FOR
1989 DAYTON ANTENNA GAIN MEASUREMENTS

Antenna range dimensions were set up per "IEEE Standard Test Procedures for Antennas", using a ground reflection range.

The antenna range was 225 feet in length, with the antennas being measured at a height of 14 feet above ground. The comparison antenna (used for a comparison signal only) was 25 feet to the side of the test antennas. The source antenna was mounted 4λ above ground.

The source antennas were as follows:

144 MHz	.75λ , 6 ele. yagi	at 27.5 feet	
220	1.4 λ , 5	18.0	(no 220 MHz entries)
432	2.10λ , 9	9.2	
903	1.26λ , 8 loop yagi	4.3	
1296	dipole/ 1.1λ sq. refl.	3.0	

The measurement equipment consisted of a battery powered PRD 277D (similiar to HP 415E) SWR meter. This instrument has a scale marked in .05 dB incriments in the expanded range! Attenuator pads were used between the test antenna and the diode detector. A high quality coaxial switch was used to switch between the comparison antenna and the test antenna.

The transmit equipment consisted of a 1000 Hz modulated 28 MHz 200 milliwatt source driving transmit converters for the various bands.

VHF/UHF Dayton Program Prize Contributors

WA1OUB – VHF PAK	RF Prototype Systems
PC Electronics	ARRL
CQ Magazine	Ham Radio Magazine
Nemal Electronics	Avantek
Al Ward, WB5LUA	VHF/UHF & ABOVE
World Radio	Dayton Hamvention
Simpson Electric/Mercer Div.	Varian Eimac

PRIZES AWARDED BY MIDWEST VHF/UHF SOCIETY & DAYTON HAMVENTION

Thanks to all who participated in the measurements, especially WD8ISK and all the other members of the Midwest VHF/UHF Society. Also thanks to those that donated prizes. Watch for information on next years's VHF/UHF program at Dayton. Any suggestion and/or comments can be sent to:

Midwest VHF/UHF Society
c/o Steve Whitefield
400 S. Main Street
Springboro, OH 45066

See you at the Antenna Gain measurements next year!

73,
Joe Burke, WA8OGS

ANTENNA GAIN MEASUREMENT RESULTS

DAYTON HAMVENTION - APRIL 30, 1989

CALL		144 MHz BAND			GAIN
N4VC	11 el.	homebrew	13.4 ft.,	1.96λ	11.9 dBd
WA8OGS	6 el.	W2PV design yagi	5.1	.75	8.8 *Ref
WA4UKW	3 el.	commercial			5.45
WB9UWA	3 el.	homebrew	2.4	.35	4.8
		432 MHz BAND			
KD8SI	38 el.	M^2 commercial	30.3 ft.,	13.3λ	18.1 dBd
NI8O	19 el.	homebrew 'RIW			15.65
WA8OGS	dipole, .165λ in front of 1.1λ sq. refl.				6.8 *Ref
W6OAL	4 el.	folded dipole, w/ triflector			6.0
VE3XCF	16 el.	modified LPTV (commercial-prototype)			5.8
WB4IZR	5 el.	commercial yagi			5.7
W6OAL	10 el.	log periodic	1.0 ft.,	.44	4.25
W6OAL		big wheel, scaled to 426 MHz			- .3
		903 MHz BAND			
NI8O	33 el.	W3HQT loop yagi	12.0 ft.,	11.0λ	17.3 dBd
WA3YON	15 el.	4.2λ NBS yagi	4.6	4.2	12.6
WA8OGS	dipole, .165λ in front of 1.1λ sq. refl.				6.8 *Ref
W6OAL	10 el.	log periodic	1.0	.9	1.9
		1296 MHz BAND			
NI8O	45 el.	loop yagi	12.0 ft.,	15.8λ	16.6 dBd
WD8ISK	2 - 3 lb. coffee can feed				5.55
WA8OGS	dipole, .165λ in front of 1.1λ sq. refl.				6.8 *Ref
NI8O	center feed alford slot				5.05
W6OAL	2 el., dipole feed corner reflector				6.45

PRIZES AWARDED BY MIDWEST VHF/UHF SOCIETY & DAYTON HAMVENTION.

Two Varian Eimac 8874 tubes were the top prizes, and were awarded by a drawing from the measurememt entrants. The winners were:

Leo Schaaf, KD8SI Bob Nygren, WA3YON

Thanks to all who participated in the measurements.

PRIZE CONTRIBUTORS

HAM RADIO Magazine
WA1OUB - VHF Pak
PC Electronics
Nemal Electronics
Dayton HamVention
Avantek

PRIZE CONTRIBUTORS

RF Prototype Systems
CQ Magazine
WORLD RADIO
Al Ward, WB5LUA
VHF/UHF & ABOVE
ARRL
Simpson Electric/Mercer Div.

BASE STATION FEEDLINE PERFORMANCE TESTING

There is a lot more to the feedline in a base station antenna system than meets the eye. Use these test and measurement techniques to monitor and to maintain feedline performance as the cable ages.

By Harold Kinley, CET

The standing wave ratio (SWR) measurement, or forward and reflected power measurement, is the single most important measurement used by technicians in testing the antenna and associated feedline. Antenna defects that affect gain and directivity usually cause an SWR increase, so a practical understanding of SWR can help you to troubleshoot antenna and feedline defects.

Abbreviations used in the following discussion of antenna and feedline tests, and in applying formulas are listed in chart 1.

Wattmeter

Radio technicians commonly use an in-line directional watt-meter such as the Bird 43. The in-line wattmeter is highly directional, so it can be used to measure a feedline's forward and reflected power.

It is the comparison of reflected power (Pr) with forward power (Pf) that is so valuable in judging the degree of mismatch that may exist between the transmitter and feedline or between the antenna and feedline (or, for that matter, between any power source and load). Technicians usually think of reflected and forward power rather than SWR units. The comparison of reflected and forward power is expressed as a power ratio (r), where: r = Pr/Pf.

The reflected/forward power ratio often is expressed as percent reflected power (r), where

R = 100(Pr/Pf) = 100r.

There is a direct mathematical relationship between SWR and the reflected/forward power ratio (r). Equation 5 in the box converts SWR units (s) to the reflected/forward power ratio (r). Conversely, Equation 4 converts the reflected-/forward power ratio (r) to SWR units (s). The graph in Figure 1 converts SWR units (from 1 to 10) to percent reflected power and vice versa.

If you are used to working with reflected/forward power readings (ratio than SWR), you do not need to convert the reflected-/forward power readings to SWR to evaluate the degree of impedance mismatch. Reflected and forward power readings alone let you estimate the SWR, once you have experience. Still, there are times when it is desirable to convert between SWR units and reflected/forward power ratios.

The box shows typical scientific calculator keystrokes that convert between SWR (S) and reflected/forward power ratios (r).

FEEDLINE ATTENUATION

A feedline's attenuation factor usually is expressed in decibels per 100 ft. of coaxial cable. Attenuation increases as frequency increases.

Measuring a feedline's attenuation usually is inconvenient because it involved climbing a tower. But when a tower must be climbed anyway, take the opportunity to measure the feedline attenuation. Measure power at the feedline input and output. Convert the power ratio to decibels. Divide the decibel measure by feet and multiply by 100 to get the attenuation in decibels per 100 feet. Compare the attenuation with the cable manufacturer's specifications to see whether the actual attenuation is normal or excessive.

Sunlight, moisture and other environmental conditions degrade feedline performance as the cable ages. Degradation increases attenuation. In recent years, improved feedline manufacturing has provided coaxial cable that is more resistant to environmental effects, cable that gives reliable service for longer periods. Figure 2 shows the procedure used to check feedline attenuation. At (A), measure forward power at the feedline input and record the reading. At (B), measure forward power at the feedline output (dummy load or antenna) and record the reading. (C) shows two ways to use the readings to calculate the attenuation in decibels.

Figure 3 shows another way to measure attenuation, based on the highly directional characteristics of the in-line wattmeter.

Wattmeter accuracy

First, check the wattmeter accuracy by connecting one side to the transmitter and leaving the other side unterminated. Forward and reflected power readings should be equal or so close to equal that you cannot see any difference. A difference between these readings affects the accuracy of test results.

At (A), connect a long, unterminated feedline to the wattmeter. Record the forward power reading.

At (B), record the reflected power reading.

Use the calculations at (C) to determined the feedline attenuation. Use the divisor 2 because the signal is attenuated twice--once as it travels tot he end of the line and once as it returns. Measurement accuracy does not depend on the wattmeter's absolute readings. Rather, it depends on the relative readings.

For example, if the forward power reading is 5% low and the reflected power reading also is 5% low, accuracy is unaffected. But if the forward power reading is 5% high, accuracy is affected.

Feedline loss vs. SWR

On a theoretical, loss less feedline, SWR is the same at all points along the line. Actually, all feedlines heave some attenuation distributed uniformly along their entire lengths. Any attenuation between the reflection point and the source reduces SWR at the source. Figure 4 shows the effect feedline attenuation has on SWR. Total feedline attenuation is 3 db, divided into 0.2 db segments. Notice that at the end of each segment (away from the reflection point), SWR becomes smaller. SWR reduction is smooth and gradual because feedline attenuation is distributed evenly.

Study Figure 5 to understand why attenuation reduces SWR at the source. At the feedline input (A), forward power is 100W. At (B), forward power is reduced to

50W, a 3 db loss caused by attenuation between points (A) and (B). At (C), forward power is reduced to 25W, another 3 db loss caused by attenuation between points (B) and (C). At (C), SWR is 3.

The graph in Figure 1 shows that an SWR of 3 corresponds to 25% reflected power, so the reflected power is:

0.25 X 25W = 6.25W

As the reflected power returns along the line toward the source, it is attenuated once again. The 6.25W reflected power is reduced to 3.125W at (B) and to 1.5625W at (A). You can determine the SWR at the three points by calculating the power ratio r (Pr/Pf) and by substituting it into Equation 4. (See the box on calculator keystrokes; use sequence A.)

Use the graph in Figure 6 to find the SWR at the antenna from the SWR (or percent reflected power) at the transmitter for various values of feedline attenuation.

SWR increases feedline loss

In the example in Figure 5, the feedline's one-way attenuation is 6.02 db. Forward power is reduced 6.02 db as it travels from (A) to (C). But reflected power causes another power loss between (A) and (C). Power absorbed or dissipated in a load (or feedline) is the net power, or the difference between forward and reflected power. At (A), net power is:

100W - 1.5625W = 98.4375W

At (B), net power is:

50W - 3.125W = 46.875W

At (C), net power delivered to the load is:

25W - 6.25W = 18.75W

Thus, the total decibel loss between (A) and (B) is:

10 log (98.4375/46.875) = 3.22 db

Notice that this is 0.21 db more than the normal feedline attenuation, which is one-half of 6.02 db, or 3.01 db. The total decibel loss between (B) and (C) is:

10 log (46.875/18.75) = 3.98 db

This is 0.97/dB more than the normal feedline attenuation. These calculations prove that standing waves on the feedline increase feedline attenuation to a level greater than normal attenuation under matched-line conditions. The amount of feedline attenuation increase depends on the SWR and the magnitude of losses under matched-line conditions. The higher the attenuation under matched-line conditions, the greater the additional attenuation caused by a given SWR; and the grater SWR, the higher the additional attenuation over the matched-line loss.

The graph in Figure 7 correlates additional attenuation with matched-line attenuation for various SWR levels.

Abbreviations

R = percent reflected power
Pf = forward power
Pr = reflected power at antenna
Pf_1 = forward power at transmitter

Pf_2 = forward power at antenna
Pr_1 = reflected power at transmitter
Pr = reflected power at antenna
r = power ratio (Pr/Pf)

r_1 = power ratio at transmitter
r_2 = power ratio at antenna
S = standing wave ratio
S_1 = standing wave ratio transmitter

S_2 = standing wave ratio at antenna
L = normal feedline loss in decibels
L_A = additional feedline loss in decibels caused by SWR on the feedline
L_T = total feedline loss

Feedline equations

(1) $r = Pr/Pf$

(2) $R = 100(r)$

(3) $r = R/100$

(4) $S = \dfrac{1 + \sqrt{r}}{1 - \sqrt{r}}$

(5) $r = [(S - 1)/(S + 1)]^2$

(6) $S_2 = \dfrac{1 + \sqrt{10^{(L/5)} r_1}}{1 - \sqrt{10^{(L/5)} r_1}}$

(7) $S_1(max) = \dfrac{1 + \sqrt{10^{(L/5)}}}{1 - \sqrt{10^{(L/5)}}}$

(8) $L_T = 10\log[(Pf_1 - Pr_1)/(Pf_2 - Pr_2)]$

(9) $L_A = L_T - L$

(10) $L_A = 10\log[(1 - r_1)/(1 - r_2)]$

Additional line attenuation

If you know the normal line attenuation from the manufacturer's specifications, you can calculate the additional line attenuation caused by SWR in the following manner.

(1) Measure forward and reflected power at the transmitter.

(2) Calculate r (power ratio at transmitter) from r = (Pr/Pf).

(3) Use Equation 6 to calculate SWR at the antenna (s2). (See sequence C in the box for calculator keystrokes).

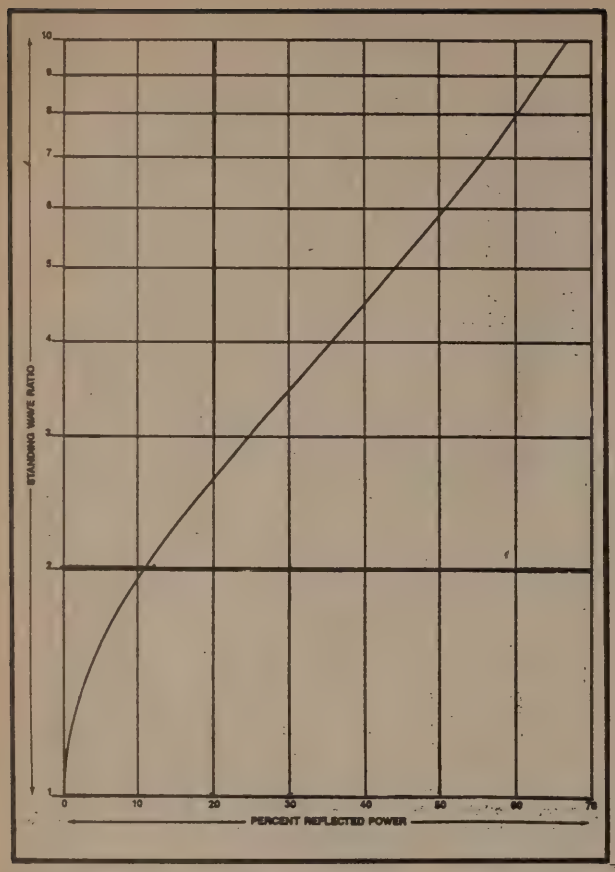


Figure 1. This graph is handy for making conversions between percent reflected power and standing wave ratio (SWR).

Scientific calculator keystrokes

Feedline/SWR calculations and conversions

(A) To convert power ratio (*r*) to SWR (*S*) enter:

r [√] [M+] [+] 1 [=] [+] [(] 1 [−] [MR] [)] [=]

<READOUT>

Example: An in-line wattmeter indicates 100W forward power and 25W reflected power at the feedline input. What is the SWR (*S*) at this point?

Solution: First find *r* from (*Pr/Pf*): *r* = 25/100 = 0.25. Now enter:

.25 [√] [M+] [+] 1 [=] [+] [(] 1 [−] [MR] [)] [=]

< 3>

(B) To convert SWR (*S*) to power ratio (*r*) enter:

S [−] 1 [=] [+] [(] *S* [+] 1 [)] [=] [INV] [√] [=]

<READOUT>

Example: The SWR (*S*) at a certain point on a feedline is 2.5. What is the power ratio (*r*) at this point?

Solution: Enter:

2.5 [−] 1 [=] [+] [(] 2.5 [+] 1 [)] [=] [INV] [√] [=]

<0.1531673469>

(C) To calculate the SWR (S_2) at the antenna, given the power ratio r_1 at the transmitter and the feedline loss, enter:

L [+] 5 [=] [INV] [LOG] [X] r_1 [=] [√] [M+] [+] 1 [=]

[+] [(] 1 [−] [MR] [)] [=] <READOUT>

Example: An in-line wattmeter is connected to the input of a feedline. The forward power reading is 50W and the reflected power reading is 7.5W. According to the feedline specifications, its attenuation at the operating frequency is 1.0dB per 100 feet. The feedline length is 250 feet. What is the SWR (S_2) at the antenna?

Solution: First, r_1 = 7.5/50 = 0.15. Next, the feedline attenuation (*L*) = 250 × (1/100) = 2.5dB. Now enter:

2.5 [+] 5 [=] [INV] [LOG] [X] .15 [=] [√] [M+] [+] 1 [=]

[+] [(] 1 [−] [MR] [)] [=] <5.425179586>

(D) To find the maximum SWR (S_1) that will be seen at the transmitter with a worst-case mismatch at the antenna, given the feedline loss (*L*), enter:

L [+/−] [+] 5 [=] [INV] [LOG] [√] [M+] [+] 1 [=] [+] [(]

1 [−] [MR] [)] [=] <READOUT>

Example: A worst-case mismatch exists at the antenna end of a feedline. The *normal* attenuation of the line is 3dB. What is the SWR (S_1) at the transmitter?

(4) Use Equation 5 to calculate r2 (power ratio at the antenna) from (s2).
(5) Substitute r1 and r2 into Equation 10 to find the additional attenuation caused by SWR. (See sequence F in the box for calculator keystrokes.)

These calculations reveal the additional line attenuation caused by SWR if the feedline itself is not defective, meaning that the normal feedline attenuation is approximately equal to the manufacture's specification and that the only reflection is from the antenna at the end of the feedline.

Notice that the greatest additional attenuation occurs on the section of line where the SWR is highest. Refer once again to Figure 4. The chart at (C) shows the extra attenuation caused by standing waves on the feedline. Notice that at points farther removed from the reflection point, extra loss and total loss decrease at each segment down the line. The extra loss approaches zero as the total loss approaches normal line attenuation (0.25 db).

Maximum SWR

Even with a worst-case mismatch at the feedline output, there is a limit to the maximum SWR seen at the feedline input. The greater the feedline's normal attenuation, the lower the limit on SWR at the feedline input.

Figure 8 correlates normal feedline attenuation with the maximum SWR that will appear at the transmitter.

Solution: Enter:

3 [+/-] [+] 5 [=] [INV] [LOG] [√] [M+] [+] 1 [=] [+] [(]

1 [−] [MR] [)] [=] <3.009520474>

(E) To find the *total* feedline loss when the forward and reflected power at each end are known:

P_{f_1} [−] P_{r_1} [=] [+] [(] P_{f_2} [−] P_{r_2} [)] [=] [LOG] [X] 10 [=] <READOUT>

Example: At the *input* to a feedline, an in-line wattmeter indicates 100W forward power and 1.55W reflected power. At the feedline *output* (at the antenna), the wattmeter indicates 25W of forward power and 6.25W of reflected power. Calculate the *total* loss (in decibels) of the feedline.

Solution: Enter:

100 [−] 1.55 [=] [+] [(] 25 [−] 6.25 [)] [=] [LOG] [X] 10 [=] <7.202144484>

(F) To find the *additional* feedline loss due to SWR, given the *power ratio* (*r*) at each end, enter:

1 [−] r_1 [=] [+] [(] 1 [−] r_2 [)] [=] [LOG] [X] 10 [=] <READOUT>

Example: The power ratio (*Pr/Pf*) at the antenna is 0.563. The power ratio at the transmitter is 0.282. Calculate the *additional* feedline loss due to SWR.

Solution: Enter:

1 [−] .282 [=] [+] [(] 1 [−] .563 [)] [=] [LOG] [X] 10 [=] <2.156430073>

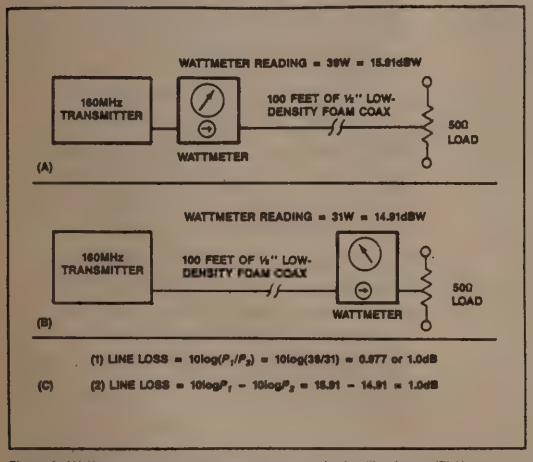

WATTMETER READING = 36W = 15.51dBW
160MHz TRANSMITTER
100 FEET OF ½" LOW-DENSITY FOAM COAX
50Ω LOAD
WATTMETER
(A)
WATTMETER READING = 31W = 14.91dBW
160MHz TRANSMITTER
100 FEET OF ½" LOW-DENSITY FOAM COAX
50Ω LOAD
WATTMETER
(B)
(1) LINE LOSS = 10log(P1/P2) = 10log(36/31) = 0.577 or 1.0dB
(C) (2) LINE LOSS = 10logP1 − 10logP2 = 15.51 − 14.91 = 1.0dB

Figure 2. (A) Use a wattmeter to measure power at the feedline input. (B) Use a wattmeter to measure power at the feedline output. (C) Use either equation and the two measurements to calculate feedline attenuation.

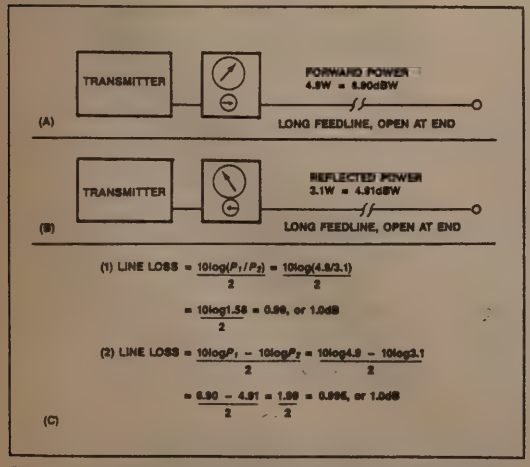
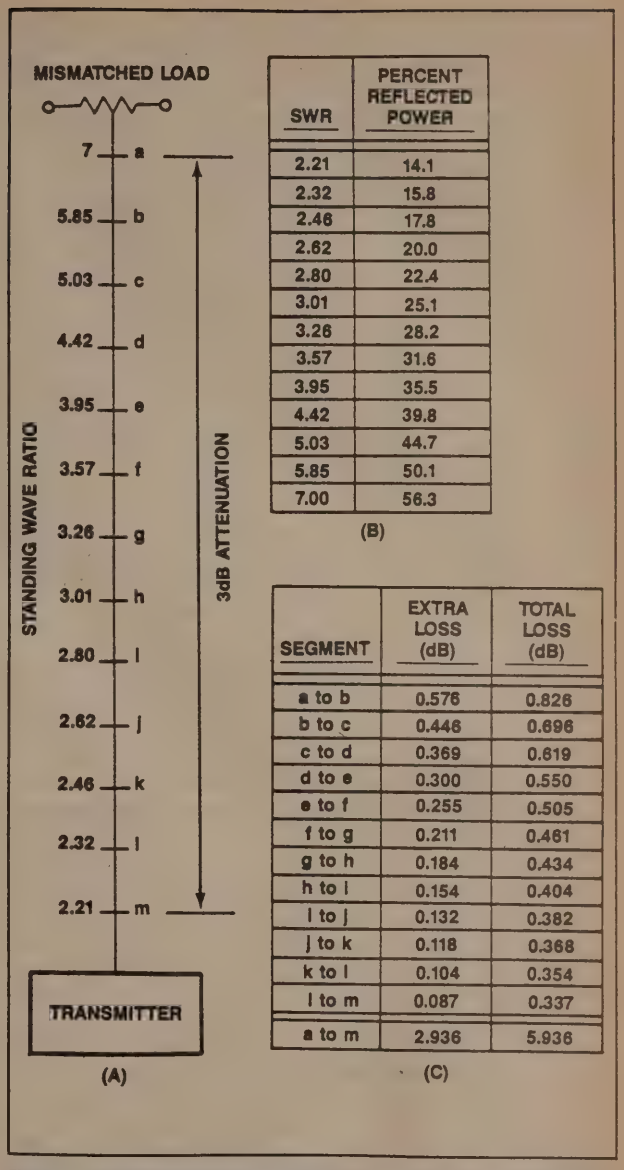

TRANSMITTER
FORWARD POWER 4.9W = 6.90dBW
(A)
LONG FEEDLINE, OPEN AT END
TRANSMITTER
REFLECTED POWER 3.1W = 4.91dBW
(B)
LONG FEEDLINE, OPEN AT END
(1) LINE LOSS = 10log(P1/P2) / 2 = 10log(4.9/3.1) / 2
= 10log1.58 / 2 = 0.99, or 1.0dB
(2) LINE LOSS = 10logP1 − 10logP2 / 2 = 10log4.9 − 10log3.1 / 2
= 6.90 − 4.91 / 2 = 1.99 / 2 = 0.995, or 1.0dB
(C)

Figure 3. Use a directional wattmeter to find the feedline attenuation by leaving the line open at one end and making forward (A) and reflected (B) power measurements at the feedline input. Then use the measurements to calculate feedline attenuation (C).



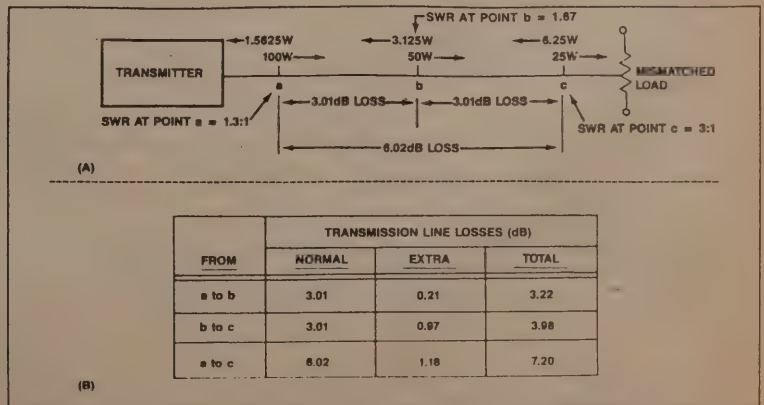
SWR	PERCENT REFLECTED POWER
2.21	14.1
2.32	15.8
2.46	17.8
2.62	20.0
2.80	22.4
3.01	25.1
3.26	28.2
3.57	31.6
3.95	35.5
4.42	39.8
5.03	44.7
5.85	50.1
7.00	56.3

(B)

SEGMENT	EXTRA LOSS (dB)	TOTAL LOSS (dB)
a to b	0.576	0.826
b to c	0.446	0.696
c to d	0.369	0.619
d to e	0.300	0.550
e to f	0.255	0.505
f to g	0.211	0.461
g to h	0.184	0.434
h to i	0.154	0.404
i to j	0.132	0.382
j to k	0.118	0.368
k to l	0.104	0.354
l to m	0.087	0.337
a to m	2.936	5.936

(C)

Figure 4. Total feedline (A) loss is 3dB. The feedline is divided into 0.25dB segments to illustrate how the SWR changes with attenuation along the length of the feedline.



FROM	TRANSMISSION LINE LOSSES (dB)		
	NORMAL	EXTRA	TOTAL
a to b	3.01	0.21	3.22
b to c	3.01	0.97	3.98
a to c	6.02	1.18	7.20

(B)

Figure 5. SWR causes extra loss in the feedline (A) because reflected power also is attenuated by normal feedline attenuation. Table (B) shows how feedline losses are distributed.

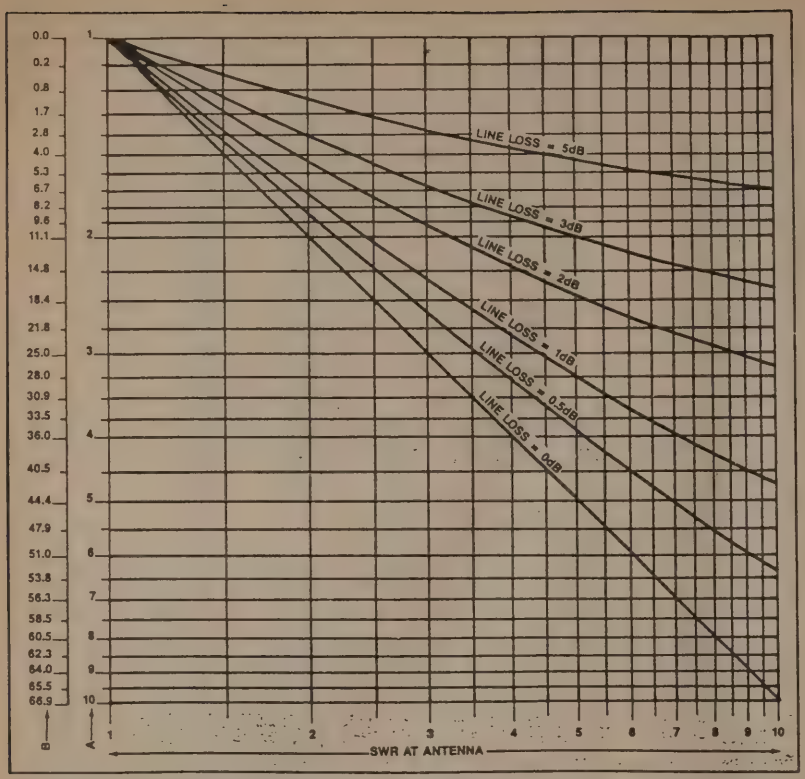


Figure 6. Use this graph to determine SWR at the antenna for various line losses from either the percent reflected power or SWR at the transmitter. The two vertical scales also serve as a simple nomograph for converting between SWR and percent reflected power. Scale A = SWR at transmitter. Scale B = corresponding reflected power.

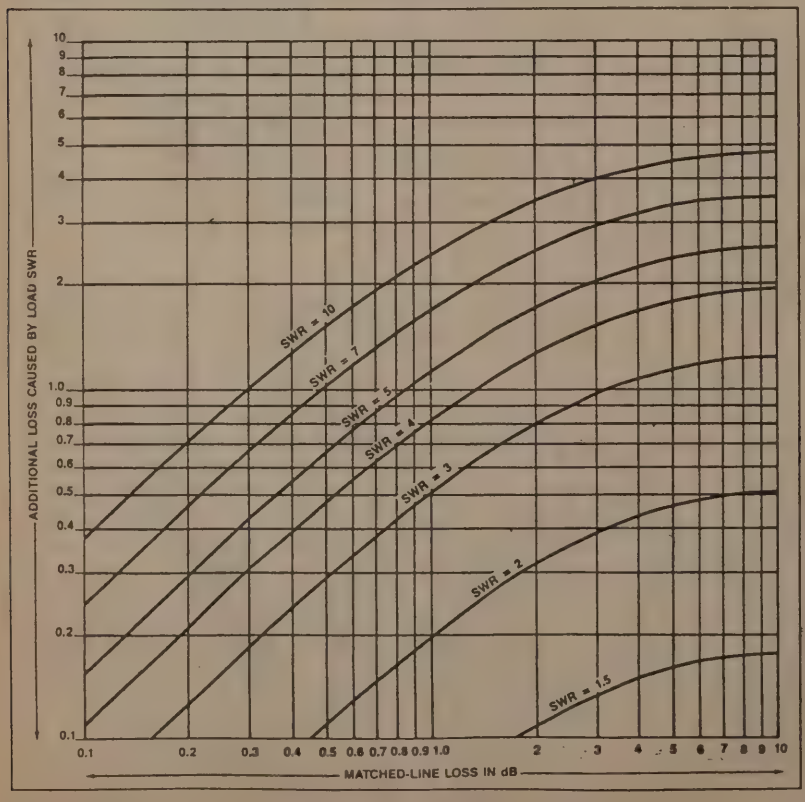


Figure 7. Use this graph to determine the *additional* line loss caused by SWR.

For example, if the normal feedline attenuation is 3 db, the highest SWR that will be seen at the transmitter is approximately 3, even with the worst possible mismatch at the feedline output. Knowing that limit can be quite helpful when it comes to trouble-shooting a problem with the feedline.

For example, if a certain feedline normally has 3 db attenuation and the feedline input SWR measurement is greater than 3, the reflection point must be somewhere between the transmitter and the antenna. Why? Because there must be much less than 3 db attenuation between the feedline input and the reflection point to produce an SWR much greater than 3 at the feedline input.

Equation 7 can be used to calculate the maximum SWR at the transmitter for a given feedline attenuation. Sequence D shows the calculator keystrokes to use.

SWR at the antenna

Figure 8 has another use: to find the SWR at the antenna from the SWR at the transmitter (or vice versa) given the normal feedline attenuation.

For example, to find the SWR at the antenna when the SWR at the transmitter is 3 and the normal feedline attenuation is 1.5 db, find 3 on the vertical SWR scale, follow over to the intersection of the curve and then down to the feedline loss (horizontal scale) at 3 db. Now move down the horizontal scale 1.5 db to 1.5 db. Then move back up to the intersection of the curve and back

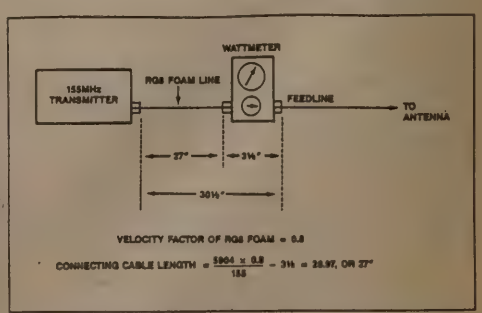


Figure 9. This diagram shows an example of how to determine the correct length of coaxial cable to use for a half-wavelength section when you tune a transmitter into a resonant line.

transmitter the same way, except that you move up the horizontal scale a=the amount of the feedline attenuation. Remember this basic rule: SWR at the antenna is always greater than SWR at the transmitter (assuming the only reflection point is at the antenna). SWR and impedance.

When a feedline is terminated by an impedance qual to the feedline's characteristic impedance, the feedline impedance at any point equals the feedline's characteristic impedance. But when the feedline is terminated by an impedance not equal to the feedline's characteristic impedance, the feedline input impedance varies with changes in feedline length.

The greater the impedance mismatch at the load, the wider the feedline input impedance variation with changes in line length. The greatest feedline impedance change occurs with the worst mismatches: open or short circuits.

A short-circuit at the end of a feedline appears as an open-circuit at a point 1/4 wavelength down the feedline, and it is the greatest impedance transformation that can occur on a feedline. Less severe mismatches cause smaller impedance transformations on the line.

The point of maximum impedance transformation appears at a point 1/4 wavelength down the line from the mismatched load. At a point 1/2 wavelength down the line, the impedance equals the load impedance. Feedlines with high SWR sometimes are called resonant or tuned feedlines. Matched lines-those with little SWR are non-resonant or untuned lines.

This phenomenon means that high feedline SWR can cause the feedline input to present a load impedance to the transmitter that differs greatly from the feedline's characteristic impedance. Some transmitters are equipped with an output matching network that provides a conjugate match to a fairly wide range of impedances. Other transmitters are more limited.

The best policy is to correct any feedline or antenna defects that cause high SWR. But if you must tune a transmitter into a resonant feedline, use a 1/2 wavelength feedline to connect the in-line wattmeter. When you measure the 1/2 wavelength section, be sure to include the length of feedline within the in-line wattmeter. If you use a length other than a 1/2 wavelength to connect the in-line wattmeter, the transmitter loading may change dramatically when the wattmeter and connecting line are removed. Imagine what would happen if a 1/4 wavelength of connecting feedline accidentally were used!

Use the following equation to calculate a 1/2 wavelength of feedline: Test cable in inches = [(5904V/F) - L] where: V = velocity factor of line; F = frequency in MHz; L = length of wattmeter line in inches.

This article delt with base station feedline and antenna performance testing. Because mobile and base station feedlines are similar, the techniques described also apply to mobile feedlines.

Although not every possible test procedure is presented, those of greatest interest to the technician are described, along with information about how to analyze the results.

Reprinted with permission from Mobile Radio Technology, April 1989. Reference: Smith, Phillip H., Electronic APplications of the Smith Chart, McGraw-Hill Book Company, New York, 1969.

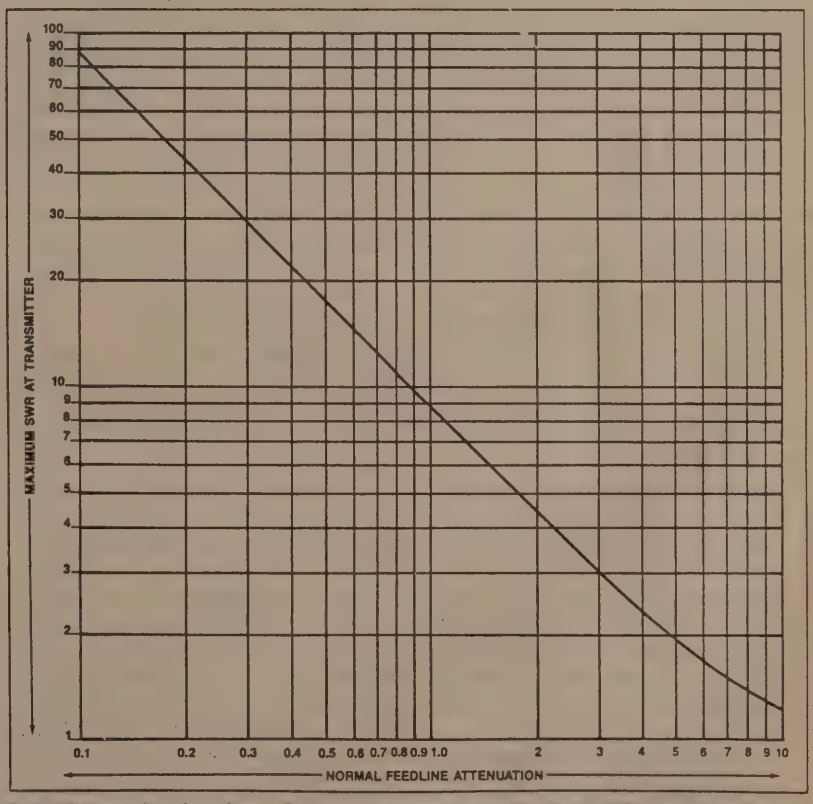


Figure 8. This graph shows the maximum SWR that can be seen at the feedline input for feedline loss values of 0.1dB to 10dB. It also can be used to find the SWR at the antenna if SWR at the transmitter and the normal line loss figure are known. For example, if the normal line loss is 1.5dB and the SWR measured at the transmitter is 3, the SWR at the antenna is found by locating SWR (3) on the vertical scale and moving over to the intersection of the curve, then down to the horizontal scale to 3. Then move down the scale to 1.5dB (3 - 1.5) and then back up to the intersection of the curve and over once again to the vertical scale at approximately 5.85.

FAST SCAN TV AND THE AMIGA COMPUTER

by John P. Spaeth KD0LO

Deep down inside all FSTVers lives a video producer just waiting for the opportunity to see or better yet create studio quality video effects.

The Amiga computer (500, 2000) can be the heart and soul of your video effects equipment. This unpretentious machine can handle video effects as well or better than equipment which costs tens of thousands of dollars. Lets take a look.

At the heart of the system is the Amiga's ability to have it's system clock genlocked to an external video source. Commodore has gone out of their way to provide a system timing port at the video monitor connector jack. Any number of suppliers are now offering genlock boards (Amigen,-Progen,Supergen) which will take a composite video source and mix it with the Amiga's video out. If for instance your color camera was displaying video of you sitting in your shack, the Amiga would genlock lock itself to that video, and assume the same video timing signals of your color camera.

This would enable you to mix the computers video with your color camera video in any way you would want to. The top half of the frame could be camera video, the bottom computer. Amiga video could be superimposed over camera video or visa versa. You could fade or wipe between the two sources without loss of sink. In short, you would have two color composite video sources which are genlocked for effects, without the expense of a sync generator, effects switcher, or color cameras which can be externally genlocked. Although this Amiga genlock business is cute, you may wonder why all the hoopla over genlocked computer graphics. The Amiga produces much more than computer graphics. Although there are several basic "paint" programs which can be used to draw high resolution graphics for your studio productions, and there are several video digitizers and frame grabbers to use with still video scenes, the Amiga has a full complement of TV production packages. These packages range in complexity from the very simple video titling programs, to the more complex real time video frame synchronizer.

Video titling is a basic titling package which has the ability to generate studio quality titles. The package, like most others for the Amiga, has hundreds of font type styles available, some of which exist in public domain and are easily obtainable. Once the title or title sequence is created, it can be animated using one of many animation programs. One can scroll in any direction, flip, fade, roll, diagonal, spiral etc. If the lettering is set against a video neutral, the animation can be superimposed over the video of your second source. As a video titling unit the Amiga gets an A+.

Beyond video titling, comes video digitizing and frame synchronization. The Amiga has the ability to run software (Video Toaster), which will digitize video from a second camera, store it in memory and reinsert sync from the first video source. The two video sources will be in perfect sync with each other without having the two sources genlocked. This process simply put is known as digital frame synchronization, and is necessary when non-synchronous video sources are to be used in special effect situations. Although the frame synchronizers have voracious appetites, the Amiga's 8 meg ram board has no problem handling the chore.

Note...Since last issue, Black Belt Systems has announced that its Slow-Scan hard/soft ware for the Amiga will be manufactured and marketed by AEA electronics and should be available by the time you read this. Everyone who has purchased the prototype model will be given full credit for the updated unit from AEA. The new unit will be 100% compatible with Robot and other popular modes, as well as several new features which include 3-D slow scan images, 5 second Panasonic mode and more. Inquiries in the USA should be directed to AEA electronics. Other ham radio related software which will run on the Amiga exists as public domain share-ware and is available from Kinetic Designs P.O. Box 1646 Orange Park, Fla. 32067-1646. Send S.A.S.E. for listing ,specify Amiga.

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	Power, nom	100 W (BNC)
		250 W (Type N)
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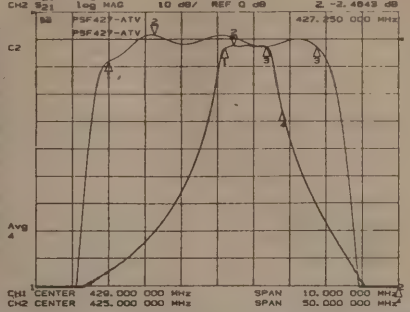
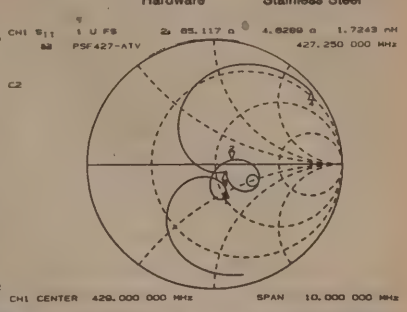
PSF 421-5	ATV Channel
PSF 426-5	ATV Channel
PSF 434-5	ATV Channel
PSF 439-5	ATV Channel
PSF 900-3	890-940
PSF 923-5	ATV Channel
PSF 1280-3	1230-1320
PSF 1280-5	ATV Channel
PSF 1296-3	1250-1340
PSF 1691-3	1650-1750


CH1 S21 log MAG 1 dB/ REF -1 dB 2: -1.8457 dB
CH2 S21 log MAG 10 dB/ REF 0 dB 2: -2.4643 dB
PSF427-ATV
PSF427-ATV
427.250 000 MHz
CH1 CENTER 429.000 000 MHz SPAN 10.000 000 MHz
CH2 CENTER 425.000 000 MHz SPAN 50.000 000 MHz



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PSf 1280	95
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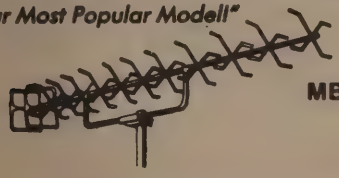

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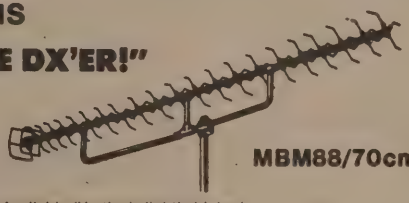

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MBM48 - 70cm	90
MBM88 - 70cm	135
DY20 - 900 (900/930 MHz)	89
1268-LY	65
1268-LY-XTN (add 21 elements)	89
1268-LY	65
1268-LY-XTN (add 21 elements)	80
1691-LY	75
1691-LY-XTN (add 26 elements)	70

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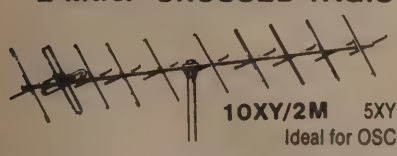

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FRONT TO BACK RATIO	18 db	20 db	22 db
3db BEAMWIDTH	H45° E40°	H35° E28°	H28° E23°
DESIGN IMPEDANCE	50 OHMS	50 OHMS	50 OHMS

10XY	5XY-137	DY-20-900
144-146	134-138	900-930
10.8	7.8	17 dbi
16 db		20 db
E40°	H 58°	H 32° E 22°
50 Ohms	50 Ohms	50 Ohms

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PMH4-2M 2M 4-way	55
PMH2-70 70cm 2-way	20
PMH4-70 70cm 4-way	37
900-2way (combiner)	ask
900-4way (combiner)	ask
1268-2way (combiner)	65
1268-4way (combiner)	95
1296-2way (combiner)	65
1296-4way (combiner)	95
1691-2way (combiner)	65
1691-4way (combiner)	95

Stacking Frames	
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FRAME-GRABBER DIGITIZER FOR IBM PC

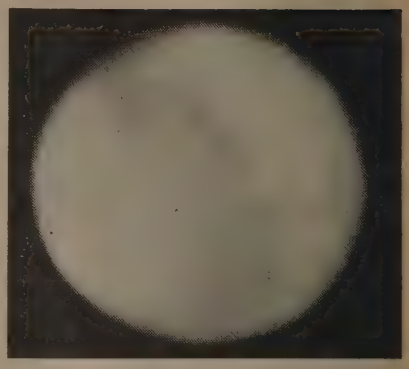
Roy Tucker, N4ABY

If you are interested in a relatively inexpensive but very powerful frame grabber for your IBM, a new product by Western Research Co. should be of interest. This device is designed to produce a 488 line, 512 pixel per line, 7- or 8-bit conversion from standard NTSC monochrome video. It has an output lookup table for contrast enhancement applications and two frame buffers that may be rapidly alternated to permit blink comparisons. One may also blink between the stored video frames and the input live video. In the 7-bit video mode, graphics may be superimposed on the displayed live or stored image.

This system is a two board set, compatible with the IBM (r) PC, XT, or AT. One board is a Video Interface Board and contains the video A/D and D/A converters, sync generator, clocks, and control circuitry. The other is a Video Memory Board and has only the circuitry for controlling the 512 kilobytes of memory that is used to store two 512 x 488 video frames The memory is capable of 512 x 512 but NTSC only has 488 visible scan lines). Under normal circumstances, the clock and sync generator circuitry relies on receiving a constant frequency (30 Hz RS-170 or 29.97 Hz NTSC) frame rate. Since VCR's can vary quite a bit, the clock's phase lock loop is usually unhappy with them. However, the system incorporates a GFM (Graceful Failure Mode) circuit that triggers the clock counters to assure synchronization errors no greater than 1/2 pixel even when the quartz clock is out of lock range. Yes, it works with VCR's!

This system is just now going into commercial production. It was originally designed for use in Bio-Medical applications. For those of you involved in Astronomy this board will allow you to easily capture images while observing for later enhancements. During the recent close approach of MARS I had the opportunity to hook this system up to a B/W Sanyo VDC-3800 CCD camera attached to a Univ. of Arizona 20" telescope. Since Planetary imaging from the surface of the earth is complicated by the distortions produced by the atmosphere, I could grab two images, blink between them to see which was the nicer image, and continue grabbing another in place of the poorer image. By continuing this process I ended up with two very high quality images of Mars in just a few minutes. Although the raw images look kind of washed out when they're first loaded up, the contrast can be stretched by storing different luminance mapping functions in the output lookup table (LUT). This also works well on live video so I wqas faced with the very peculiar situation that I could see more detail on the TV monitor than I could looking through the telescope eyepiece! This feature should be a help to ATV'ers trying to pull in those weak signals. Image noise can also be reduced by averaging successive frames (enhance those P1 signals into something watchable!).

A kit version of the commercial frame-grabber will be available in the near future consisting of the blank boards with complete documentation and appriorate sources for the chips. Essentially, just add the TTL devices and carefully assemble the board set. The price of the kit will be approximately $350 and should help bring about the beginning of a new era of cheap image processing for the masses. For further information contact: WESTERN RESEARCH Company, 2127 E. Speedway Blvd., Suite 209, Tucson, AZ 85719. (602) 325-4505.



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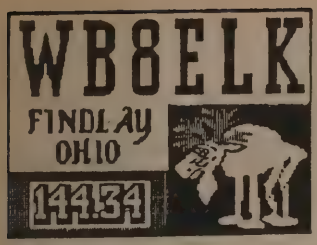
The Group now markets an exclusive 1.3 GHz GaAsFET preamp, especially designed and manufactured by G4BVK. With a noise figure in the region of 1 dB and a gain of up to 17 dB, this highly effective design has been thoroughly tested on GB3ZZ since October 1988, and helped the Group become the leading UK 23 cm station in the 1988 International ATV contest.

Now you can buy these preamps only through the Group. They are ideal for increasing the performance of a satellite receiver, or for mast head mounting. However, please note that the preamp does not contain any change over circuitry. The cost is only $48.00 each, plus postage of $1.50 if applicable. Checks for pre-amps should be made payable to K. STEVENS.



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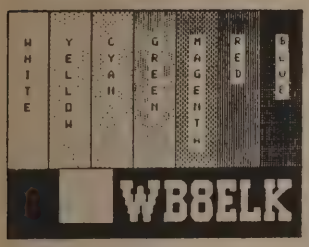

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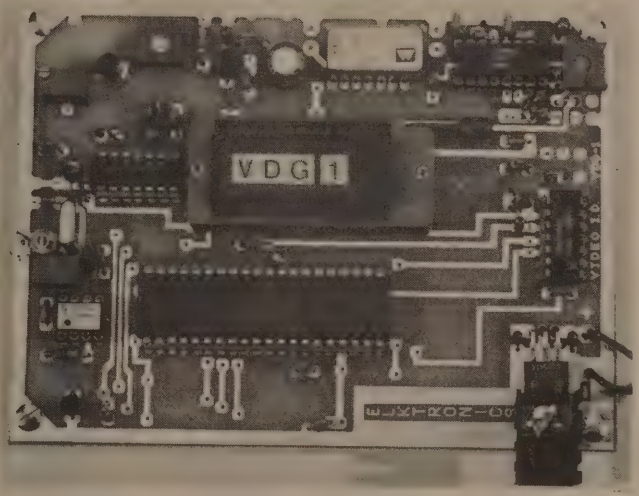

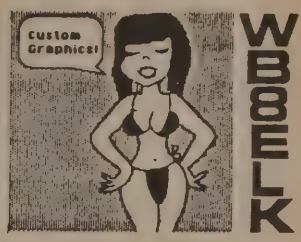

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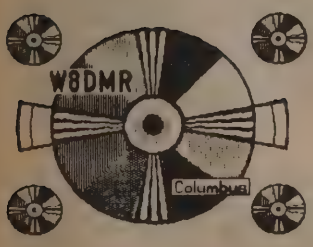
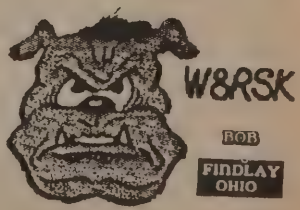




GO FLY A KITE!

After the local radio club meeting, Jon, WM8W, came up to me and said "Why don't you take your ATV equipment & Go Fly a Kite!". This was not meant as an insult, it turned out that Jon had been thinking of flying an ATV kite for some time.

Jon wasted no time in putting this feat together and made a trip the next day to a kite store called "On the Wind" in Grand Rapids, Ohio. He came back with a massive 12 foot Delta Wing kite which looked like a mini hang-glider. The initial flight test with a lead weight payload showed that 2 pounds was the limit in a moderate wind. Since weight was critical, a lightweight package was assembled. It consisted of a P.C. Electronics TXA5-5 80 mw exciter, an Elktronics VDG-1 video ID, two Polaroid lithium flat-pack batteries and a Big Wheel Antenna constructed by Norm, WV7K. This was all housed in a styrofoam container in case of a hard landing! The total weighed in at 1.5 lbs.

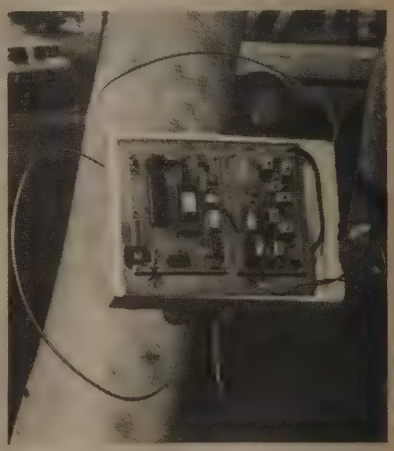
On May 10th, the launch team met three miles south of Arlington, Ohio for the first flight. With the help of W8ZD, N8FGU, WB8MSJ, N8FMM and son, John Billerman, and Mike Ricksecker we assembled the kite and payload. The payload was attached about 20 feet from the kite and suspended below the main line via a cradle arrangement to provide some stabilization. Although excellent winds had been blowing all afternoon, about 5 minutes into our first attempt the winds died out almost completely. Mother Nature wasn't going to let us succeed without a fight. (Apparently the only way to ensure good strong winds is to attempt a balloon launch!). Soon the winds picked up and the second flight was underway. The kite reached nearly 250 feet altitude and over 800 feet of line had been reeled out. Reception reports were starting to come in from stations in all directions when disaster struck! A sudden wind gust had broken the main spar on the kite and it fluttered down directly over the railroad tracks. The train whistle confirmed our worst fears...the kite was heading on a collision course with the 5 pm Baltimore & Ohio freight train! Although a kite flying along behind a train would definitely be a first for ATV, Jon thought that they would probably charge us fare so he did his best to reel in the line. Narrowly missing the train, our worries were not over as the kite now was draped over power lines dangling directly over a pond! Fortunately Jon was able to pull the kite along the power lines until it was over solid ground and Mike ran in and caught it.

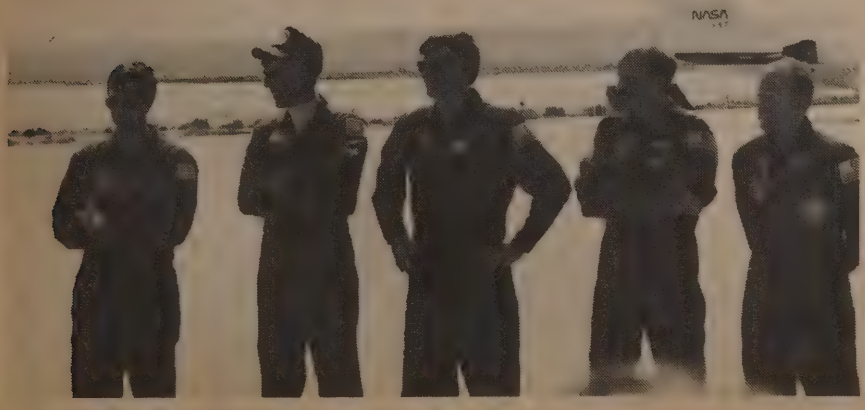
After some emergency repairs and reinforcements, we went for one last flight. This time all worked well and a height of 500 feet was achieved with over 1100 feet of line out. The signal was received P4 to P5 by W8RSK, WB8MSJ, and WA8HDY in Findlay at 10 miles distance. WQ8L (ex-K8LZG) had a P3 at 20 miles and even though the package was running only 80 milliwatts, W8RVH could see our sync bars over 65 miles away.

Jon is currently building a 16 foot Delta Wing. This monster kite should allow us to lift a 1 watt ATV transmitter as well as a live TV camera. We will be using the Uniden B/W CCD security camera sold by P.C. Electronics as well as DAK Corp. This camera can be stripped down to a very light 2.5 ozs and has a built-in electronic auto-iris. We may also have a Ricoh FF-7 or FF-90 35mm camera attached to take still pictures. This camera has auto-advance and built-in timer to take a picture every minute. Jon plans to achieve an altitude of over 2500 feet on the next flight for some real DX! (NOTE: It's important to notify the FAA when flying kites over 5 lbs. above 500 ft or near an airport.) Also a flight is planned on July 22nd and 23rd over the Armstrong Air & Space Museum in Wapakoneta, Ohio to comemmerate the 20th anniversery of the Moon Landing.

For those who would like to try an ATV kite flight, an excellent book is available from most kite stores call "Kite Aerial Photography" written by Mark Cottrell - The Kite Store LTD, London England. This book contains charts and programs to determine the kite size necessary for various payload sizes. Several means of stabilizing a camera are described in detail as well as contruction plans for building your own kite. Two of the best kite designs useful for large payloads are the Delta Wing and the Parafoil. The Delta is easy to fly, is very stable and can handle turbulent winds. The Parafoil can lift a little more payload and will fly at a somewhat steeper angle but doesn't like turbulent conditions. For more information send a SASE to Jon C. Pifer (WM8W) P.O. Box 574 - Arlington, OH 45814.

I'm rapidly running out of different methods to take ATV to the "air".maybe a carrier pigeon? I just hope no one tells me to take my ATV equipment and Go Jump in the LAKE! - Bill, WB8ELK





SPACE SHUTTLE LANDING

Space Shuttle mission STS-29 provided ATV'ers across the country a week of spectacular earth views. The NASA select satellite signal was retransmitted through numerous ATV repeaters across the country. Henry KB9FO made arrangements for press passes with NASA and the ATVQ reporting team headed off to visit Edwards AFB and watch the return of this excellent mission. We arrived at Edwards at midnight to avoid the early morning crowds and sacked out in Ernie's WB6BAP camper on the Dryden dry lake bed. From our vantage point at press site 3 we should've been only a couple thousand feet away as the shuttle landed. At sunrise we started to set up our cameras to discover that the runways had been changed. The shuttle would be nearly 2 miles at closest approach. Fortunately Ernie had his secret weapon along....His 10 inch telescope! The shuttle was getting closer and soon a tremendous double sonic boom nearly flattened us as it flew directly overhead. With Rod WB9KMO manning the video camera, Bill WB8ELK on the still camera and Ernie WB6BAP on the telescope we started snapping away. The shuttle curved around to line up the runway and made a beautiful landing to top off a flawless mission. Ernie's telescope really paid off and provided us with some great close-ups of the landing.

Later we were able to drive within 1000 feet of the Shuttle which really gave us an idea just how big this vehicle is! To top off the day we were treated with a visit with the astronauts and a tour of the NASA facility. Congratulations to NASA for one great flight and keep that Shuttlevision coming!

PREDICTING ATV RANGE SCIENTIFICALLY

by Henry B. Ruh KB9FO

One of the first questions a new ATVer will ask is, "But how far can I transmit?" Several rules of thumb have been offered over the years which apply as most approximations do. Here is a what I hope you will find to be a more reliable way of estimating the range between your UHF stations (ATV or other modes) and the stations you contact. You can also use it to estimate the atmospheric improvement factors of band openings, by knowing how strong a signal should be and comparing it to how strong the signal actually is, you can achieve a reasonable estimate of how much the band has improved over normal conditions.

Because of the infinite number of variables caused by differences in station equipment, local conditions, receiver performance and the like, a set of "normal station" conditions is used as the basis for this effort. There are factors explained in the text and in the charts which can compensate for your particular situation. The only condition which cannot be calculated remotely is the effect of local terrain. Obviously, a mountain behind your home will seriously effect your expected range no matter what other factors are in play.

For a close approximation you need to obtain first, a set of USGS (U.S. Geological Survey) maps or next best, a sectional aeronautical chart for your area. Locate your QTH on the maps and observe the terrain in the eight cardinal directions from there: east, northeast, north, northwest, west, southeast, south, southeast. You can make estimates of the relative level of the land in each direction in relation to your QTH. If you desire, you can achieve a mathematical average by determining the land elevation above sea level each 1/10 mile for 10 miles, but accuracy of this level is not needed. What you want to know at this point is: about how high or low is my QTH relative to the average elevation in each direction. An estimate to the nearest 20 feet is close enough for our endeavor this time. Also, you can plot on these maps the locations of other stations who you normally contact and gain an idea of how the land lies in between. Often the operator is surprised to learn that the land may rise and fall as much as 200 feet in the "flatlands" and serves as a terrain barrier in what may often be thought of as a flat area.

Now, let's introduce some new terms. DBK is shorthand for DB relative to a kilowatt. We will use this term to express your transmitter power, ERP and a new function, ETERP, or Effective Transmitted Effective Radiated Power. This last term is a "ham" term to indicate the power your transmitting system would have if the receiver QTH had a dipole, it includes gain factors for the receiver height, antenna gain and related functions which we would normally call system gain factors. The DBK is an easy term to deal with, and you will see, when we get into the simple math, how easy it is to use for determining system gain and other noteworthy items. Zero DBK is equal to one kilowatt. A 100 watt transmitter, therefore, is -10 DBK. A 10 watt transmitter is -20 DBK, etc. This is a logarithmic relationship, so a 50 watt transmitter is equal to -13 DBK...not -15 DBK.

Another useful term is DBU, or DB relative to a microvolt. This is a more useful term for determining receiver sensitivity and listing the relative signal levels to produce various signal qualities. Unlike the DBK, which is related to POWER, thus a base 10 log, DBU is relative to VOLTAGE and thus, is a base 20 log. Zero DBU is qual to 1.0 microvolt. +20 DBU is equal to 10 microvolts. 3.16 uV equals +10 DBU.

Now let's start looking at a typical ATV UHF station and see how the numbers plug in. For our station, we will assume a transmitter power of 100 watts, an ultimate receiver sensitivity of 1.0 uV at which point sync bars is barely visible in heavy snow (about 10 pounds per cc hi). We will also guess at 2 db line loss for good coax, and say that you have 18 db of antenna gain. Our simple math looks like this:

Transmitter power	-10 DBK
Line loss	- 2 DB
Antenna Gain	+18 DB
ERP =	+6 DBK

or roughly 4 KW.

Now let's look at a typical receiver. Prediction charts provided by the FCC for the UHF TV reception are reproduced here for your edification. You can use them or the handy chart I've made which condenses the more relevant figures. The first thing we notice is that the charts are for a "standard receiver." We know that hams are never standard, so we need to include some "fudge factors" in our work to compensate for the better than "standard" performance of our ATV and UHF stations. We will call these Improvement factors. The most obvious is the general trend to have an antenna higher than "average" (30 feet). So here is our chart for antenna height "Improvement" factor: For antennas between 0 and 30 feet above average terrain (remember the terrain radial data from before?) we have no improvement over the chart. For other heights, we can use the following figures:

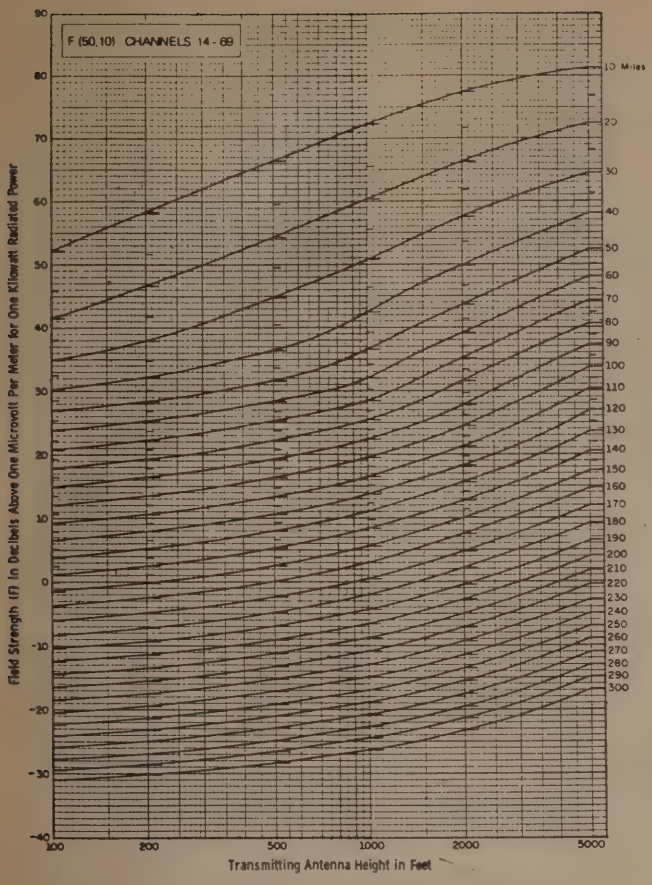
0 - 30 feet	0
30 - 50 feet	+2 DB
50 - 75 feet	+4 DB
75 - 150 feet	+6 DB
150 - 300 feet	+10 DB
300 - 500 feet	+15 DB

over 500 feet Forget this and call me for a DX operation!

Again, we will do some simple math:

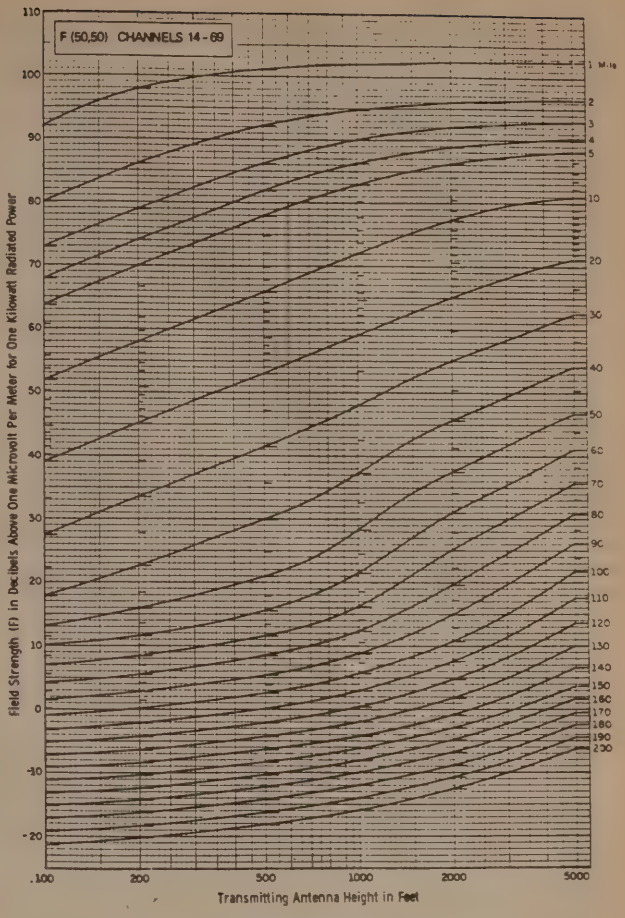
RECEIVE STATION	
Antenna gain	+18 DB
Line loss	- 2 DB
HAAT	+ 4 DB
Improvement Factor:	+20 DB

This is the system gain improvement factor caused by the receiv-



TELEVISION CHANNELS 14-69
ESTIMATED FIELD STRENGTH EXCEEDED AT 50 PERCENT
OF THE POTENTIAL RECEIVER LOCATIONS FOR AT LEAST 10 PERCENT
OF THE TIME AT A RECEIVING ANTENNA HEIGHT OF 30 FEET

FCC §73.699 FIGURE 10c



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ESTIMATED FIELD STRENGTH EXCEEDED AT 50 PERCENT
OF THE POTENTIAL RECEIVER LOCATIONS FOR AT LEAST 50 PERCENT
OF THE TIME AT A RECEIVING ANTENNA HEIGHT OF 30 FEET

FCC §73.699 FIGURE 10b

TX HEIGHT ABOVE TERRAIN (FEET)			50	100	200	300	400	500	1000	
+26	+36	+16				RANGE (Miles)				
P6		P5		5	8	12	16	17	18	24
P5	P6	P4		9	15	20	24	26	28	35
P4	P5	P3		20	25	28	33	35	36	44
P3	P4	P2		30	34	37	41	44	45	55
P2	P3	P1		40	50	56	59	63	66	75
P1	P2	P0		75	80	85	90	93	95	108
P0	P1	DX		120	125	128	131	134	140	145
DX	P0			170	175	182	188	193	198	205

To use the FCC charts:
1. Find your ETERP figure.
2. Choose the P level you desire to estimate the range of. Read the corresponding DBU number for that P level. i.e., 70 for P6.
3. Locate 70 on the left edge of the chart.
4. Subtract from 70 the ETERP number, i.e. +26 for the result of 44.
5. Locate the line corresponding to 44 on the left edge.
6. Read across to the vertical line corresponding to your transmitter height (antenna) above average terrain. i.e., 200 feet. (The 200 at the bottom of the chart means 200 feet.)
7. Read the range in miles to the predicted signal level from the curves. The miles is the right hand scale. In this example, 29.5 miles.

er QTH conditions of the station which is looking for your signal. We will add the receive figure to the transmit figure +20 + (+6) = +26 "DBK" ETERP. So the effective transmitter ERP of our station when contacting our other "typical" station is the same as having +26 DBK to a "standard" receiver. Each station will be different because of terrain, line losses, antennas, transmitter powers, etc. If we assume a serious ATVer or UHF DXer at each end, then our "typical" station figures are quite valid, even conservative, considering some stations I know.

All well and good, but how does this relate to how good a picture you will receive and how far you can normally transmit that picture. Let's refer to the old familiar P system of picture reporting. Basically the system rates the quality of the picture by the amount of snow in the picture vs. a "snow free" picture, which we call "closed circuit" quality.

We will use the following simple chart to relate a picture quality with actual signal level. P0 equals, "with a little imagination you can see something once in a while." While P6 will equal a broadcast quality signal with no visible degradations.

P0	3.16	uV = 10 DBU
P1	10	uV = 20 DBU
P2	31.6	uV = 30 DBU
P3	100	uV = 40 DBU
P4	316	uV = 50 DBU
P5	1000	uV = 60 DBU
P6	3160	uV = 70 DBU

(Hams use P0-P5 for signal reports, I've added P6 for comparison to broadcast signals) Also equipment used by non-broadcast folks like us have a best video S/N ratio of 45 db or so. Thus we can't get better than original sin (SINAD).

From this we can also make a second chart, based upon the FCC predictions which will relate our improved system and accommodate the "standard" chart since we have already made our compensations to use the charts as is.

How to use the chart.

First, calculate the ETERP of your system. Now compare that to our "typical station." The chart below is based upon the +26 figure of our typical station. If your figure is less, you will have less range for a given signal quality. If your signal figure is more than +26,, your signal will be stronger. Values should be significantly different to observe a change in picture quality. A difference of 1 or 2 DB is minimally noticed. A change of 5 or 7 will make a noticeable improvement and a difference of 10 would make a difference of one P level. (For purposes of this chart useage a P signal level is 10 db., In ham use a P signal is about 6 db according to Tom W6ORG) Thus, for each 10 DBK difference between your ETERP and +26, you would step up or down the chart by one P level.

The final fudge factor is for the transmitter antenna height, which was not included in your earlier calculations. To use the chart, select the column which best describes your antenna height above the average terrain height for the selected direction. Below that is the range to each of the various levels of picture quality in miles. A "DX FACTOR" P level is given which is an estimate of the ultimate range (under non-band opening conditions) of your ATV station, for those who insist that they can see a picture at the threshold of receiver sensitivity. Three different P levels, corresponding to three calculated ETERP levels are given to help you interpret the chart. Differences of less than 10 could be extrapolated but the difference in miles would be insignificant and the errors from approximations would exceed the difference.

If you use modes other than ATV, you will have an additional improvement factor which will be the receiver bandwidth, and thus noise level in the receiver system which will make the ultimate sensitivity better than the 1 microvolt used here. For the purposes of using the chart for other bandwidth signals you can use the simple formula: for each one half reduction in bandwidth from 4 Mhz, you can add 3 DB to your ETERP. For narrowband FM you can add 23, for SSB 30, and CW, add 40. (20, 4, .4 khz bw)

Estimates of atmospheric improvements can be made easily. An improvement of one P level is equal to about 10 DB. The refraction angle change can be given from the apparent increase in antenna height, i.e. if the band opening allows stations to be seen at 100 miles at a level equal to that you normally see at 50 miles, the refraction of the atmosphere has created an antenna gain of 600', read by going horizontally on the chart.

Best of all, have fun and good DX.

ATVQ editorial policy is to provide technical material of interest to those interested in visual communications. We invite contributions which are about any aspect of amateur television. ATVQ evaluates all material published for accuracy. Construction projects are evaluated for likelihood of repeatability by another builder. Because of variance in construction technique exact results may vary depending on the critical nature of some signals but a working unit must have been built or demonstrated prior to our publication of an article. ATVQ makes no guarantee of a builders success. When additional information is needed the article will indicate that the reader should contact the author prior to construction for additional information.

SUMMER CES SHOW - Chicago

Bill (WB8ELK)

Time again for the Summer Consumer Electronics Show. This show is held in Chicago each June at McCormick Place and is a massive display of the latest and greatest in video and audio consumer electronics. After miles of hiking through all the exhibits I was able to turn up some interesting new items for the ATV'er. Miniature cameras are starting to turn up as a separate item from several manufacturers. SONY has a very nice ultra-miniature color CCD camera (model CCD-G1) which is a companion to it's Video Walkman. The Video Walkman is a complete 4" LCD TV with built-in 8mm recorder. This apparently is currently available from many stores in a 3" and newer 4" TV screen (models GV-8 and GV-9). One of the smallest camcorders made (SONY Handicam) will make it's debut soon and is not much bigger than most TV cameras! Another very small B/W camera will be available from citizen for home security (model VC-100s) complete with an LCD monitor. Although not the greatest resolution this will be good for R/C aircraft and anywhere a super lightweight camera is needed. There will be some astounding improvement to LCD TV sets in the near future if the prototypes are any indication. There even was a display of a large LCD TV that mounts on the wall like a picture. The Panasonic 6" LCD sets were simply amazing although still in development stage. Toshiba had some excellent 4" LCD sets on display which are available in Japan and may be available in the US in 1990. They even had an LCD TV projector for truly big screen TV. Sharp had a complete LCD TV with detachable tuner that is currently available. Hitachi had some beautiful color video printers on display. They even had a model which made color prints from an IBM interface. If you can afford the $3000- $4000 price tag for the model VY-100 or 200 this would sure be a nice way to document your ATV contacts!

VCR's with consumer video tape editing features are beginning to show up. These new decks have some very professional features including a jogging dial. This allows you to advance or rewind the tape by an individual frame or zoom to the proper spot at continuously variable speeds. The Panasonic 4990 is designed with feature as well as the Hitachi VTS-S730A. Go Video may be coming out with a dual-deck VCR which should allow editing and copying with one machine.

For those of you wishing to edit tapes using your existing VCR's, the Videonics DirectED Plus system may be for you. This unit interfaces with two VCR's and actually controls the record unit to produce some professionally edited tapes. This unit has titling capabilities as well as computer scenes you can superimpose on your tape. A review of this system will appear in the next issue of ATVQ.

This show is always fun to attend, although somewhat frustrating when you realize you may have to take a trip to Japan to get the good stuff!

CAMERA AMATEURA
ATV Activity in Bryan, TX

by Joe Fisher, K5EJL

"Anybody know of any ATV activity around here?" I asked. Surrounded mostly by genuine Aggies on their home turf, I felt somewhat out of place to begin with and would not have been shocked by a "what's ATV?" type answer. What I found instead was a great bunch of folks at the February 11 meeting of the Brazos Valley Amateur Radio Club, including 5 who are already active on 70cM ATV.

The club was beginning Field Day plans and about 50 were in attendance. The program was a lively discussion of "What's A dB anyway?" that would have benefited any newcomer to UHF. In short, a long lossy (lousy) transmission line literally negates much of antenna gain or transmitter power. After the meeting, I returned to the QTH of Council Mills, WB5IKP, long-time friend whom I had gone to Bryan to visit. We got on the phone and found "Cotton" Freeman, N5AVK, at home in the shack and right around the corner from Council.

As we walked up the driveway at N5AVK we could peer through the open radio room door; wow! All manner of rigs four HF/VHF/UHF and modes including packet, satellite, and ATV. Two computers and an assortment of homemade interface devices tried to impress organization upon the maze of cabling which interconnected everything. Two towers and half a dozen or so antennas crowned the shack, a separate room Cotton designed large enough to accommodate two workbenches and several visitors.

But then it was time to get down to business. Cotton got on 2M and raised John German, W5HBH, for an ATV QSO. A little difficulty prevailed. "I've got too many switches!" said Cotton. "It's hard enough to get from transmit to receive, much less one mode to another. I've got to do something about that."

Soon OM German's face popped onto the monitor. "Hey. That's good. We've got a little herringbone pattern here, but it's a good picture," said Cotton. "How about a QSL card so I can take a picture of the screen for our newsletter?" I asked. The picture on the screen careened about; "What we need over here is a cameraman!" John shot back.
Next scene was of an unknown ham sitting in front of a modest tabletop HF rig. The lens was pulled back. The call sign YU2BHI appeared at the bottom of the screen. "Now that's DX!" said Council, an inveterate VHF DXer, to this point absorbed by the six shelves of equipment confronting us. "Not any QSL; YOUR QSL," said Cotton, crossbanding in "speakerphone" mode as so many ATVers do. I took a picture of this screen anyway. I was tempted to submit it but our stuffy editor would likely cut it, it being the April issue and everything.

Demos then proceeded with computers, packet BBS's and the KC satellite tracking program. "I try to keep the Keplerian data up to date in this machine," said Cotton. "One day we'll have ATV through a satellite; won't that be something?" Indeed

wants to try to get a repeater up over there but manpower is limited and they feel like they should take a conservative or "let's-do'what's-been-done" type approach. Very sensible I think. But interest is growing, and it's just a matter of time before ATV is as common a mode as FM!

A PLAN FOR ATV NET OEPRATIONS

John Jaminet W3HMS-ATV

As hams, we are technically smart and sometimes artistically rather dumb. Here is a plan which may spruce up your local operations and put some fun in your ATV life. It was written for a specific group in this area and only the names have been changed to protect the guilty.

Assumption:: Net meets on Tuesday (or whatever is your choice) nights at 2000 on 146.?? Mhz audio, video 439.25 Mhz via Simplex or repeater.

Purpose:

1. Increase participation by ATV-'ers

2) Promote increased fun/technical growth

3) Promote increased skills by Net Control Stations (NCS) through planning and sharing of the job

4) Improve operations by use of "Theme Nights"

NCS Objectives:

1) Plan the theme night ahead and solve "lead time" issues before hand

2) Encourage maximum participation

3) Remember that an NCS fails when he (or she): A) Talks much and people do little B) Has no theme and no plan for sequential or otherwise recognition and activity C) Is slow to recognize stations D) Fails to keep order and promote activity.

4) Remember that an NCS succeeds when he (or she): A) Talks little B) Stimulates activity and people have fun C) Has a theme and a plan of fair rotation D) Quickly recognizes stations/needs E) Courtesy keeps order and promotes activity f) Courtesy and firmly keeps non-ATV traffic from interfering with the Net.

5) Theme Night Activity Ideas: A) Everyone shows vacation pictures/slides B) Everyone shows and tells about one new piece of equipment--whether HB or purchased C) Show movie excerpts or short movies (only GP 13 ? and up, please) E) Show off ATV logos and/or computer program logos/test patterns F) Project Show and Tell G) Explain how the Model ABC-123 superduper cubic inch kilowatt all bander works H) This week we spotlite station "W3ABC"..."this is your QTH!" I) Video tape the other stations and replay on the air K) Conduct portable ATV Operations from Bravo Mountain to the Ajax Shopping Mall L) ATV nostalgia pictures/tapes/short movies under 15 minutes M) Tech session: proper adjustment of each station's sync levels

6) NCS assignments for discussion and agreement a) Step 1 is agree on the assignments by date B) Step 2 is assign topics from the list here or by other means by date and hence, by person C) Step 3 is each NCS prepares for the Net D) Step 4 is simple----enjoy!! Note: If an NCS can't make the schedule he arranges a swap. In an emergency the last NCS is the 1st alternate and the next NCS is the 2nd alternate. Date/Call March WA3ZZZ, 14 March K3ABC, 21 March N3DEF, etc. Happy Net Time, 73, John. Hope you can use it!!!

FM MODULATOR FOR THE TXA5-33

Lowell Brown, K8PYQ

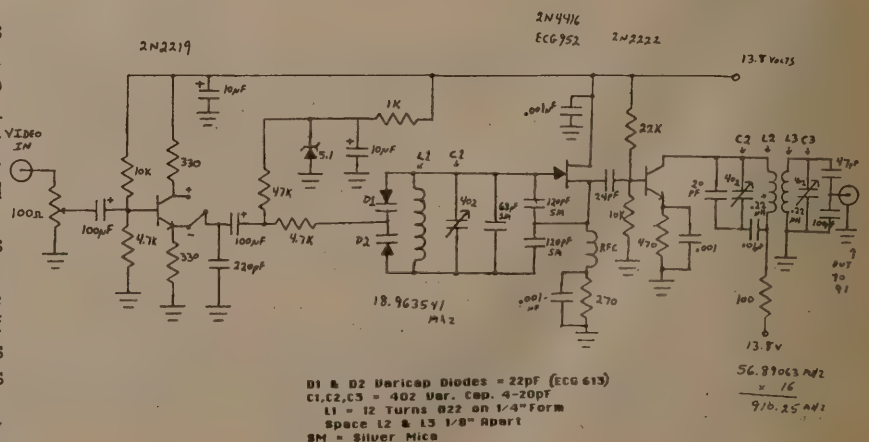
This circuit will FM modulate the P.C. Electronics TXA5-33 900 Mhz 1 watt transmitter. This has been used in conjunction with a modified TVRO satellite receiver to experiment with the advantages of FM ATV. The video input to this circuit should be run through a pre-emphasis circuit first for best results.

The following modifications need to be done to the TXA5-33:

- Remove the 10 pf feedback capacitor on Q1.
- Add 0.001 uf capacitor on emitter to ground of Q1.
- Remove crystal from TXA5-33 and connect the output of FM modulator through 50 ohm coax. Connect center conductor to base of Q1 and shield to ground.

You may change the video polarity on the modulator by moving the 100 uF electrolytic from the emitter to the collector of the 2N2219 and reversing the polarity of the electrolytic.

If higher deviation is desired, use higher capacitance varicap diodes although the 68 pF silver capacitor may have to be changed to a smaller value.

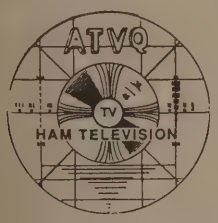


LIFE AFTER DAYTON/BATC AND OTHER GREAT TIMES!

BY HENRY KB9FO

Yes it can be done! But not without a little effort! As we mentioned in the April issue I would be going to Dayton and then on to England for the BATC convention in Coventry. But first, the rest of the story (apology to Paul Harvey).

ATVQ had a booth at Orlando Hamcation and it was great! The turnout was excellent and the event was well planned and executed. We met a lot of hams from more than 20 states and Canada there and were lucky enough to find someone who would make the test pattern badges for ATVQ which we had at Dayton. The Florida group had these and with a little change they made good ATV ID badges for ATVQ readers. You can get these while supplies last at our hamfest booths.



Dayton is covered elsewhere by Bill, so nuf said. Friday was a busy day for me as I set up the ATVQ booth in the commercial space at Dayton, then manned the booth until Bill WB8ELK arrived. Mike WA6SVT helped Henry after flying to Chicago and working a few ATV stations the night before. About 3 I took off for the stores and got the goodies for the ATVQ party at the Travel lodge motel. Don't forget we will do that again next year, and Chuck WA7SRZ from the Western Washington ATV club (Seattle) will be the host. Then I drove to the airport loaded with supplies and travel items for the trip to London. I had a short layover in Chicago, just long enough to eat dinner with Sylvia, then on to the 747 for London. 7 hours later, with about an hour "nap" I arrived at Heathrow.. Not everything arrived with me. One piece of my luggage did not come out the chute. The Box of April ATVQ's The most important item and the entire reason for the trip! I could have done without my clothes, buying what I needed there, but there was no way to get more magazines before the Hamfest! (Yes, they did finally get there but they were delivered Sunday night, after the hamfest!) Luckily Andy G8PTH had a sample for display!

Chris G8AUU met me to provide a ride to Northampton (home of J-Beam antennas). Chris is an engineer for LWT TV in London. On the way to Andy G8PTH's QTH in Northampton we stopped in an 900 (not a typo) year old pub for a brew and a few quaint tourist spots.

Andy G8PTH was gracious enough to put me up for the week and took the week off to shuttle ourselves around the countryside in search for the ultimate ATV plunder!

If Dayton is the king of hamfests, then the BATC convention is the king of ATV functions. The day was clear and warm, the entire week was a balmy 75-85 degrees, unseasonably warm for England. The hamfesters started to arrive at 9 (door open at 10, very civilized hours for a hamfest. By best estimates 1100 to 1200 ATV'ers went through the gate before the end at 4 PM. Goodies galore. The indoor area was filled to capacity all day with buyers and there was no shortage of sellers both commercial and individual. The bargains were too much. I nearly spent my entire weeks funds and had to pass by several items because I couldn't rent a trailer to tow behind the 747 coming back!

The odd things I noted was that Tek test gear we would pay $800 for here was selling for $15 there, but old tube equipment we wouldn't think of using brought top $ (pound). The reason is the cost of repair parts. One ATV had an entire barn (a side triP) of functional Tek and H-P test equipment, by our standards about $2 million or more. Stacks of each kind by series (ie piles of 465's, 465A's, etc) and equipment type, scopes, generators, analyzers, etc. It was more like a Tek factory than a ham shack! The ATV'ers were very friendly and I collected video tape interviews of many groups. I was also interviewed for TV while there and did a forum talk about ATV in the states. (PHOTOS ON FOLLOWING PAGES)

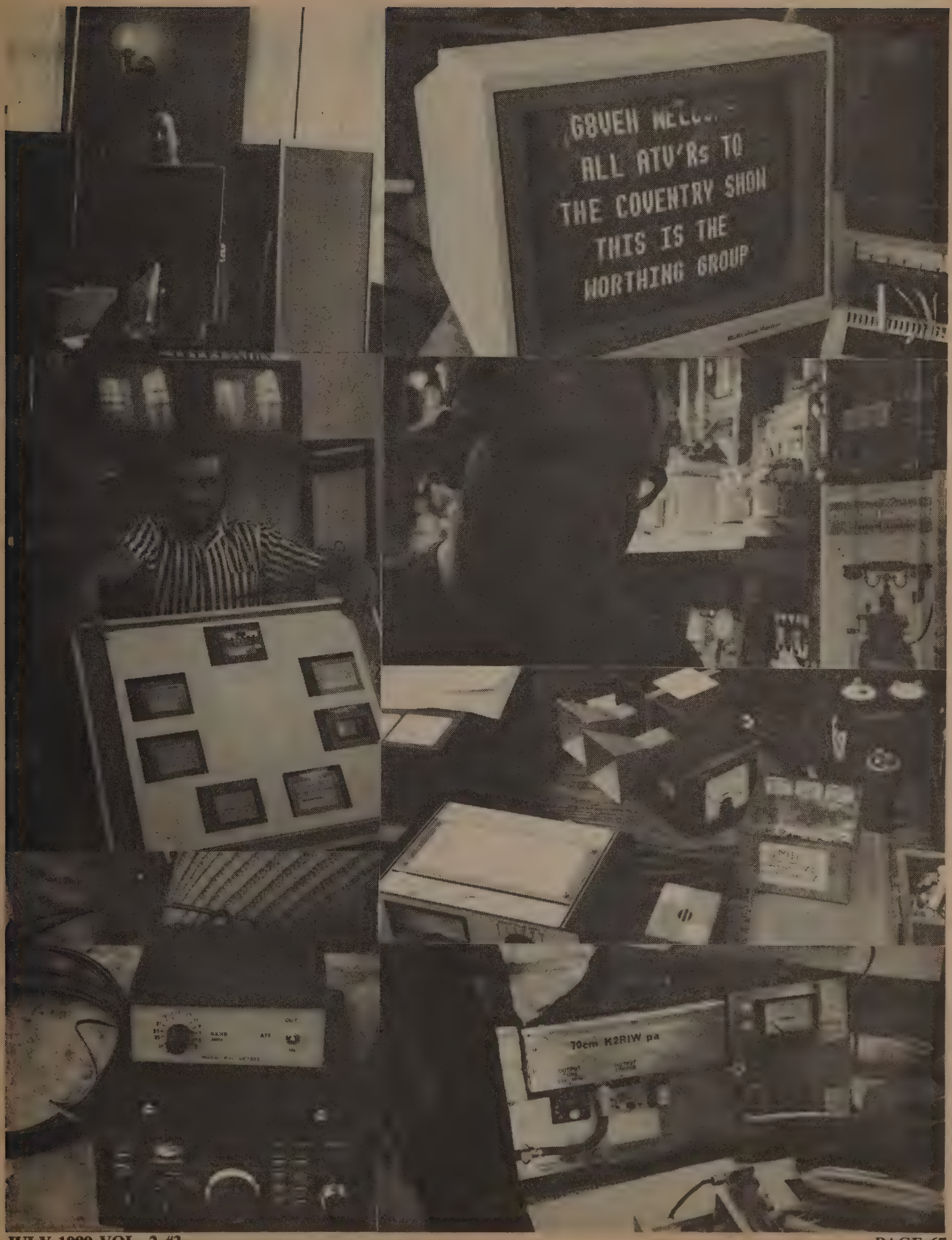
Atv is not allowed in aeronautical mode, and power limits cut into range, so there is a great deal of activity in antenna and preamp design and in activity in the bands above 450. There is also a group of hams using the now obsolete 405 line UK system.

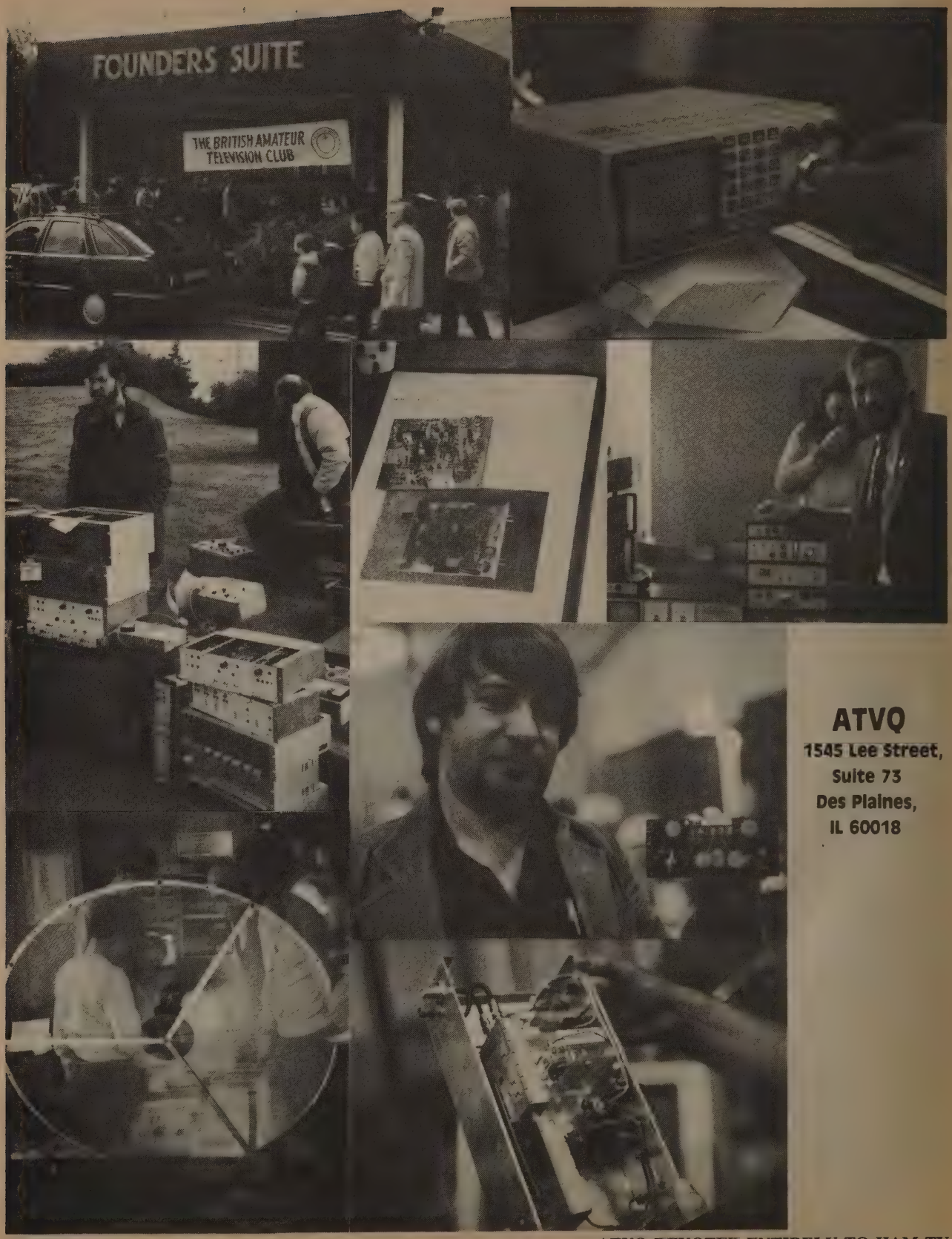
Plunder was everywhere and I did manage to buy four amps including a French TV transmitter which was rated at 1100 watts input and 50 watts out (at -56 db intermod products). A different bias and PS should make this baby hum a new tune into my coax. It tunes channels 14-83 plus extra at each end, the hope is it will tune 902-928 for high power (600-1000W) operation there. I also got a 1280 Mhz wideband amp using two 2C39's for about 200-300 watts out on that band. Andy was later able to send me three pull-out tubes TH326, for the first amp. Anyone out there with some GOOD TH326 thompson tubes?? They look like FAT 2C39's. (triodes)

Andy, who is author of several books and has a big second hobby of antique telephones and works for British Tel, and I spent the rest of the week travelling to various electronic and book shops in several cities where we found a lot to buy! Several good buys on reference and text books on TV, Radar and similar areas. Numerous electronic goodies including some very nice 450 Mhz channel filters to get rid of FM QRM in video (the 442-445 Mhz region). These were a cheap $2 each. silver plated mini-cavity filters with BNC connectors.

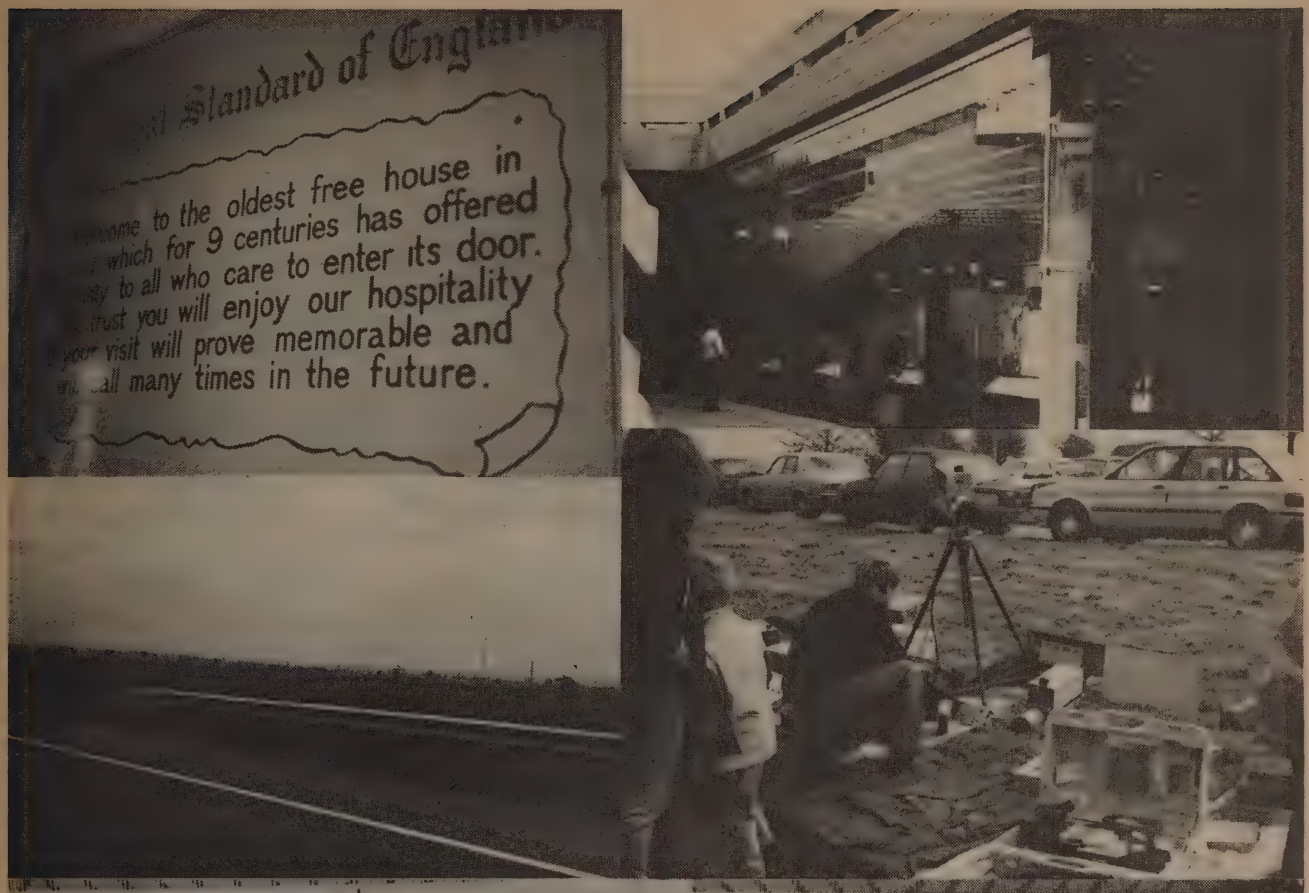
There are still some good electronic junk shops in England including one genuine "war surplus"

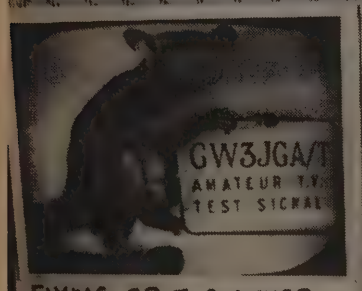
MAIDEN
219E
GENUINE GOVT. SURPLUS
ELECTRONICS · CLOTHING
MACHINERY · CATERING
MILLIONS OF ITEMS
COME & BROWSE!
Walk-Round DEPOT
ANCHOR
ARMY SURPLUS
OPEN 6 DAYS
9 a.m.
INCINERATOR ROAD
406 HENRY'S AUDIO ELECTRONICS CENTRE 404
COMPUTERS COMMUNICATIONS EQUIPMENT COMPONENTS
COMPONENTS SPARES AUDIO
EQUIPMENT COMMUNICATIONS
COMPUTERS ACCESSO
RNSIDE


ALL ATV'Rs TO
THE COVENTRY SHOW
THIS IS THE
WORTHING GROUP
70cm K2RIW pa



ATVQ
1545 Lee Street,
Suite 73
Des Plaines,
IL 60018


Standard of Englan
come to the oldest free house in
which for 9 centuries has offered
to all who care to enter its door.
trust you will enjoy our hospitality
your visit will prove memorable and
all many times in the future.

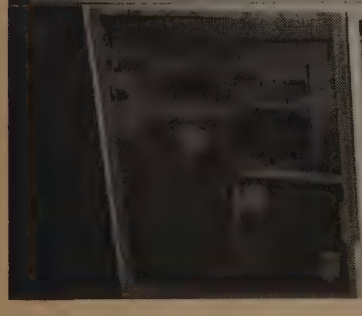


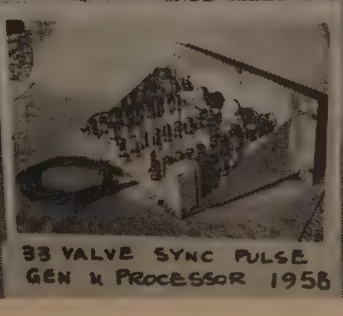
FLYING SPOT SCANNER
1958
CRM 121 SCANNING TUBE
931A PHOTOMULTIPLIER

SHACK 1962

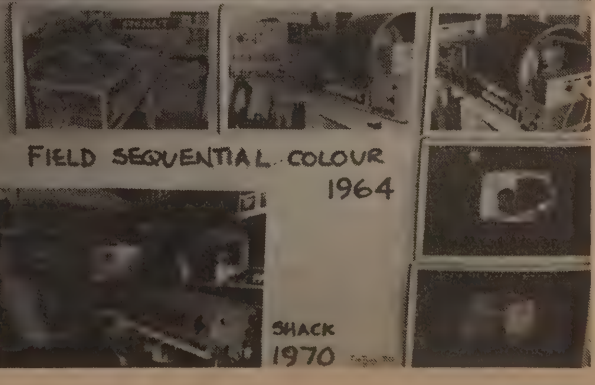
1958
LICENCED GW3JGA
JOHN LAWRENCE
PRESTATYN

FIELD SEQUENTIAL COLOUR
1962





33 VALVE SYNC PULSE
GEN & PROCESSOR 1958



FIELD SEQUENTIAL COLOUR
1964

SHACK
1970

yard (complete with a real boat anchor!) which had an entire building for electronic goodies. We found a lot of test gear and RACAL receivers and other good stuff.

UK hams are also very active on the microwave bands. Many had 10 Ghz equipment operating at the hamfest and power modules and discrete exciters/receivers were seen. Also sets of FM TV modules to build equipment for various bands was on hand. FM TV seems to be quite popular in the UK.

Andy expects to be over to the states for several weeks in April of 1990 and will be visiting my QTH in Chicago and the Dayton hamvention. My sincere thanks for Andy's help. I had no problem with the language barrier (hi) but I don't think I could drive the 100 MPH + e-ways the wrong way and survived! Also to Chris for the transport and tour of LWT TV and the MOMI musem (on his day off!) And thanks to the many BATC members we met at the hamfest.

EUROPEAN AGENT

Mike Wooding 5 Ware Orchard, Barby, Nr. Rugby, Warks., CV23 8UF, UK is now agent for ATVQ for Europe. Subscriptions and inquiries should be directed to Mike. Because of exchange rate variances check for latest sub rates.

BATC DATES

Late reports also say the BATC will try to schedule their hamfest NOT on the Dayton weekend so more on each side of the pond can go to both. If you are a true blue ATV er, you need to visit the BATC convention at least once in your lifetime!

OTHER TRAVELS

Besides the trip to the UK, I was also traveling around the states. Have to keep up with Bill HIHL Travel took me to Portland, Seattle, Dallas, LA, and Venture (Ojai). The trip to Portland & Seattle provided an opportunity to meet with the WWATS group. (Photo on front cover) A phone call before hand brought great results. Chuck Northcutt graciously put together a quick get together of many of the area ATV stations at his house. A contingent of ATVers met me at the airport and drove me to Chuck's QTH. There was a buffet dinner for all (!) with leftovers for the family cat. The group brought out the video camera and lights and "grilled" me on various topics in ham radio and ham TV to show at they club meetings. An on-air QSO was also set up through their repeater which had excellent picture/sound and coverage with Tom K7KAI. A very fine system. Present at the get together were, Chuck W7SRZ and family, Cindy N7MHW, Russell KW5O, Mark WR7V, Nancy KB7BJE, Bob W7BGP, Bob NX7N, Marina N7LSL, Donna KB7FHJ, Lou K7YZZ, Amile (from AEA) NE5S, Dick W7TWU and Chuck KE7SA. Afterwards a ride back to the airport and the flight home, arriving at 5 AM Chicago time!

Being an ATV'er must also mean not getting much sleep!

DALLAS

The ARRL national in Arlington, TX was also a hit for ATVQ. Andy W5YS was operating the ATV station at the convention and also dropped by the booth. Again we were warmly greeted Texas style and met a lot of south central ATVers from TX, OK, KS, AR, AZ and other states. We also got to eyeball the TX half of the ATV DX record holders Bill K5ARS of Austin, TX. (having met the FL half while in Orlando). The fest was at the Texas Rangers Stadium/Convention center which is right next to 6 Flags park and a number of other vacation attractions.

NEW ATV MANUFACTURER!

One of the major ATV attractions at Dallas was the introduction of a new ATV equipment manufacturer! T D SYSTEMS of 6419 Rock Springs Dr., Arlington, TX 76017: 817 483 4994. On display was their unit which is different from everyone else's in that it is a MAST MOUNTED TX RX and shack mounted controller unit. One controller can be used for several bands. On demo was equipment for 450, 900 and 1200 Mhz. The TX RX units are in Hammond type die cast boxes. The controller is in a handsome case with metered video, audio, plus numerous controls for bells and whistles. The unit features full monitoring of audio/video, soft touch switches, sub carrier sound, automatic mic level, video white clip-ping, automatic pedistal control (prevents over modulation and buzz) and built in modulator to monitor transmitted signal. The unit works AM and FM and additional bands are accomodated with upgrade of the main control box. Also on display from T D SYSTEMS was a multiple stacked quad (also known as a Z Panel) gain OMNI HORIZONTAL STACKABLE 900 AND 1280 MHZ antennas.

Photos of test signals through the systems showed FLAT response on Multi-burst video and excellent linearity on stairstep, no vertical interval sag and full T pulse response! Near commercial quality!

LA AGAIN

Seems it was just last january when I was in LA for the Rose parade, well back again, only for 10 days this time. The purpose of the trip was to participate in a UCLA extension program in management techniques but it also left a little time to operate while travelling from LA to Ojai and back. I managed to find Mike WA6SVT's QTH in the moun-tains without too much trouble...talk in all the way! I also got my Larsen Mag mount antenna fixed, seems my poor portable/mobile range was due to a shorted coax connector put on at the factory! Thanks Mike.

The view and operating from his QTH is fantastic. I had to drive down and through the clouds the next day to get to LA, but it was CAVU at Mike's. Several ATVers were on the various LA area ATV rpts and I was able to work several on ATV and a lot more on 2 meters while traveling around. Naturally I stopped off to visit Tom and Maryann at PC to get the latest news there.

Ernie and the ATvers were running a special event station one weekend from the Griffith observatory just above Holly-wood. They connect a TV camera and ATV transmitter to the big tele-

scope and transmit the pictures to various schools in the areas as well as other amateur astronomers. This lets a lot of people peer through the lens when normally it would be occupied by only the operating astronomer. This is a regular operation for the ATN group.

While there I was also able to visit the Ham Radio Candy Store in Riverside which will also be carrying ATVQ as a regular item, and also a couple of surplus parts houses for some power supply goodies (I still need some 3-5 KV 20 uFD or more filter caps for my 900/1200 KW supplies...anyone got any?

'Ol Henry will be traveling around more this year as well. A trip to St. Louis a couple of weeks ago after the Indy ATV Club meeting (Memorial day weekend) allowed contact with KD0LO and WB0ZJP. The 4th of July took Sylvia, Henry and Chuck (jr op) back to St. Louis to claim a puppy from John, KD0LO and a vacation visit to the area. You just never know where I'll be next! For sure, Orlando in Thanksgiving week and Hawaii next March! And for certain another BATC convention. We just made a lot of great friends in the UK and at the BATC and can't wait to get back for another visit. 73 Henry KB9FO.

 # 1000

When ATVQ was started our business plan was based on an estimate of 200 subscribers per issue growth. Needless to say we have exceeded than many fold. We are quickly approaching the 1000 mark in paid subscribers (and enjoy a good retail sales level as well). It occured to me that it might be nice to do something for # 1000 whomever they are. So, if you are thinking of subscribing now is the time because I will give a FIVE YEAR FREE SUBSCRIPTION to the 1000th subscriber!

BACK ISSUES

We have none! We've sold out of every copy of every issue. Vol. 1 # 1 and 2 were small sample issues (150 copies each) and the January and April issues were 3400 and 3500 each. As I write this there are 22 copies of April left and a Hamfest or two yet before July gets back from the printer.

To solve this delima we will provide an archive to: ESF COPY SERVICE, 4011 Clearview Dr. Cedar Falls, Iowa 50613.

THE ROSE PARADE HAM TV VIDEO TAPE

Now available is a limited quantity (only 100 copies were made and 20 were donated to the participants) of video tapes made at the Pasadena Rose Parade. The tape contains the following: Open logo, "please pirate" notice and introduction by Henry KB9FO. Followed by about 20 minutes of behind the scenes video shot at the Wrigley Mansion showing the TV feed control and beginning of the Satellite TV feed. Followed by the 2 hours sent via satellite, followed by 2 hours more of the ATV public service effort to the parades conclusion. In total over 4 1/2 hours.

The masters were shot on S-VHS and VHS HQ and 3/4" U-matic. These were dubbed to 1" C broadcast format and assemble edited. Then the 1" completed master was dubbed to 6 hr mode (SLP/EP) VHS using a $250,000 Ikegami mastering machine used to make master reference tapes for VHS alignment. The video quality from the VHS master making machine is higher than any 2 HR mode industrial or home VHS machine! In short, you couldn't get a better tape if you were there doing it yourself. The few video wiggles were from the live feeds as received at parade HQ.

Henry pre-paid to have the tapes edited and duplicated. We are offering them at cost, which includes the dubbing, editing, tape stock, vinyl case with labels, shipping box and shipping costs. We are doing this so that other groups can have a "showcase" program of ATV public service. Your cost is $20 post paid. NO VISA, M/C or COD.

Send your order to ATVQ, Rose Parade, 1545 Lee St., Suite 73, Des Plaines, IL 60018. Allow two weeks for postal delivery or 1 week for UPS. This program is not available from any other source.

THE MT. WILSON ATV REPEATER

Doug Moon, K6KMN via John, WB6ZPN

The K6KMN ATV RPT is located in the channel 40 transmitter building on Mt. Wilson, almost 6,000 ft. above LA. All of the commercial broadcast TV TX are crammed on to this site for wide coverage of the So. Cal population center. The ATV coverage is as far as San Diego 110 miles away! (ed. note)

Greetings fellow ATVers.

First of all, this letter goes out in thanks to all of those who have supported the ATV repeater in the past and the present. Your time, money and encouragement has made it possible to have such a useful extension to our communications.

I am pleased to announce, as of April 1, 1988, the repeater system is back on the air, better than ever, after an absence of almost 2 years due to facility renovations, technical problems, and divorce. Now, with ATV activity in Southern California on the "upswing", it is rewarding to see the positive response and enthusiasm. This kind of feedback is very incentive to maintaining a good repeater system. Several "Old Timers" are active again, along with those who have taken their rigs out of "Moth Balls" since the repeater is up again. The repeater has been refitted in a nice new 7' rack cabinet, and several up-grades to the xmtr and receiver to improve performance. Still needed is new "Heliax" for the receiver antenna, proc. amp repairs, and several mods to control circuits.

Also, as of July 4, 1988, a new Monday night ATV activity net has been started. So far, the response has been very encouraging. Time is 8:00 p.m. thru Mt. Wilson, 1241 Mhz. video, and coordinated on 146.43 Mhz. FM.

Some future plans include coverage into the High Desert, alternate input or output freqs., better receiver, higher output, and several user functions.

Upcoming events: Angeles Crest 100 mile endurance race, Oct. 1&2 partial ATV coverage, possible NASA space shuttle video, and ATV "show and tell" on the Monday night net.

If you have any suggestions, questions, contributions, or information to pass along, send all correspondence to:
Doug Moon K6KMN (owner and trustee) Mt. Wilson ATV repeater system, P.O. Box 40, Mt. Wilson, CA 91023

Phone: 818/440-1116. Home: 805/-948-2388. That's all for now, folks-.. BCNU on ATV Monday night, 73, Doug Moon, K6KMN, Mt. Wilson ATV rptr system, Input 434 Mhz., opens on horiz. sync freq. Output 1241.25 Mhz., audio sub +4.5 Mhz. NTSC video, power out approx. 10 W avg.

A VSB FILTER FOR 1253 MHZ

Mike Collis WA6SVT

Last year the amateur TV network's Santiago Peak repeater had to go vestigial sideband, because of FM repeaters on the same hilltop that were recently installed. They were getting QRM from the TV repeater's secondary sidebands. We tried a cavity and it was too sharp so another way had to be tried. An interdigital design was chosen. The repeater already used VSB filters on 434 and alternate 426.25 inputs, Spectrum International was the supplier. No VSB filters were commercially available for 1253 MHz at the time, so I called John Beanland from Spectrum International. John told me he had not yet built a VSB for the 1250 MHz band because of a lack of interest by the Amateur community. He gave me much needed information on how an interdigital filter worked and without his help this filter would not have been built.

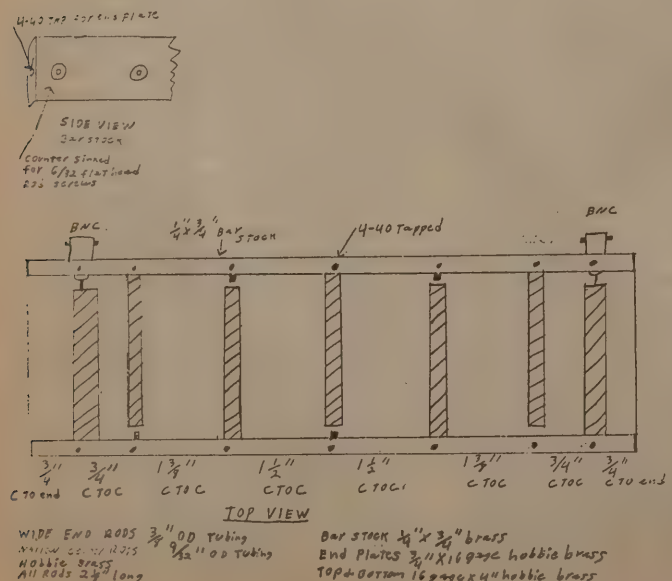
The filter is made of brass available from hobby stores or exotic metal shops. I chose to use tubing rather than solid rods to cut cost and inserted 1/4" X 1/2" 6-32 thread stand offs into the rod ends. Next I soldered them in place. The BNC in and out connectors connect to the 3/8" rod ends. The rest of the rods are tuned by 8-32 set screws and locked in by use of nuts. Tolerance is a must. A 1/16" deviation can cause a major shift in performance. Bar stock is drilled and tapped on edge with 4-40 holes for top and bottom plate attachment. It is drilled and counter-sunk on the flat side for rod attachment directly in line between the holes in each edge of the bar stock. Holes on each end are centered for attachment of the end plates.

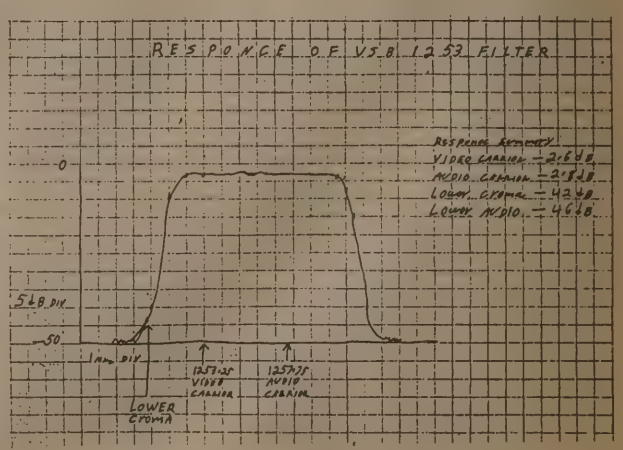
The top plate has to be cut to a size of 2 13/16" X 8 5/8". Drill holes in top plate to match the edge 4-40 tapped holes in the bar stock. The Bottom plate is identical to the top plate except it has 1/2" over hang on each end to allow for mounting the filter to a relay rack panel.

The brass should be polished before assembly. Then, tune it using a sweep generator and spectrum analyzer. If none is available, tune it to the center of the desired passband using a signal generator and spectrum analyzer. Then connect an ATV transmitter and tune for lower sideband and suppression below 2 MHz from carrier frequency. Loss should be 4 Db on video carrier to upper sound carrier and -40 Db on lower sound carrier.

When you are satisfied with your filter, disassemble and have all parts sliver-plated 3/10 mil or more. Electronic Precision Specialties Inc. has a first class plating house. Silver plating was only $75 complete, including a conversion bath to retard corrosion. Send your hardware too. The $75 is a minimum and Hank Brown, the owner, told me that the minimum charge would cover the cost of plating of about three filters, if all parts were sent together. His address is: 537 West Mercury Lane, Brea, CA 92621. Phone: (714) 529-4547. Hank plates all kinds of electronic parts and hardware and can also do gold plating as well as many other exotic metals. Loss after plating is 2.6 Db. Passband: 9 MHz wide. VSWR is 1.5 to 1.

A final note: Spectrum International has just introduced a 1200 Mhz band VSB filter 2.8 Db loss 7 MHz wide with a 1.12 to 1 VSWR. I would like to thank John Beanland from Spectrum International for helping me with this project.


4-40 TAP FOR END PLATE
SIDE VIEW
BAR STOCK
COUNTER SINKED FOR 6/32 FLAT HEAD SCREWS
BNC
BNC
1/4 x 3/4" BAR STOCK
4-40 TAPPED
3/4" C TO END
3/4" C TO C
1 3/8" C TO C
1 1/2" C TO C
1 1/2" C TO C
1 3/4" C TO C
3/4" C TO C
3/4" C TO END
TOP VIEW
WIDE END RODS 3/8" OD TUBING
NARROW CENTER RODS 9/32" OD TUBING
HOBBIE BRASS
ALL RODS 2 1/4" LONG
BAR STOCK 1/4" X 3/4" BRASS
END PLATES 3/16" X 16 GAGE HOBBIE BRASS
TOP & BOTTOM 16 GAGE X 4" HOBBIE BRASS



The Radio Amateur's Journal

ON THE COVER: With his retirement from the U.S. Senate, Barry Goldwater, K7UGA, finds more time available for his life-long hobby of Amateur Radio from his home QTH in Scottsdale, Arizona.

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MODEL ROCKET ATV

Bob Rau (N8IYD),
1450 Jeffery St.
Ypsilanti, MI 48198

Now you can fly along with your model rocket via ATV! Towards this end a 109" long rocket 2.6" in diameter was constructed weighing about 6 lbs. with the electronics. The ATV and telemetry system was constructed on cards which slid into individual rocket sections via card guides. The modules consisted of the following:

1) A 68HC11 microprocessor with R/W memory and EPROM, a parallel port to drive the video overlay, a mercury switch to indicate acceleration, and an eight channel A to D converter.

2) A SONY XC-37 video camera with telemetry displayed by a 20 column by 9 line character overlay on the live video.

3) A P.C. Electronics TXA5-5 80 mW exciter was specially modified to fit into the payload sections. The video and sync stretch circuitry was cut off and rewired on the end of the board.

4) A battery board holding 14 AAA cells will power the system for 15 to 20 minutes.

5) Power Supply board. Converts the main power bus (22-28 volts) and converts this to the standard power bus (battery, +12, +5, GND, -5, -12 and pyrotechnics control.

6) A mirror module for relecting the camera's view outside of the rocket. This mirror will flip over when the rocket descends on the parachute to maintain a view of the ground below.

7) An analog card holding the two pressure transducers and amplifier circuitry for the sensors and the temperature sensor.

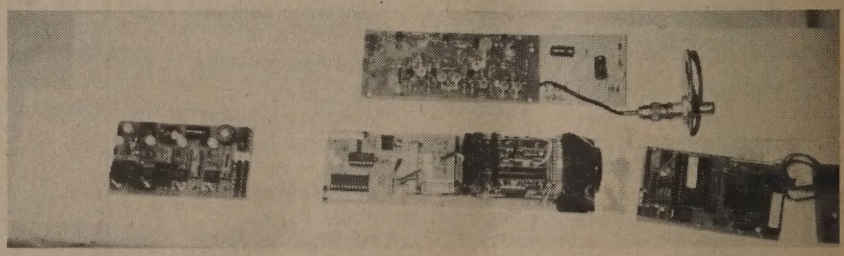
8) A temperature sensor ring section exposing the thermistor to the outside air.

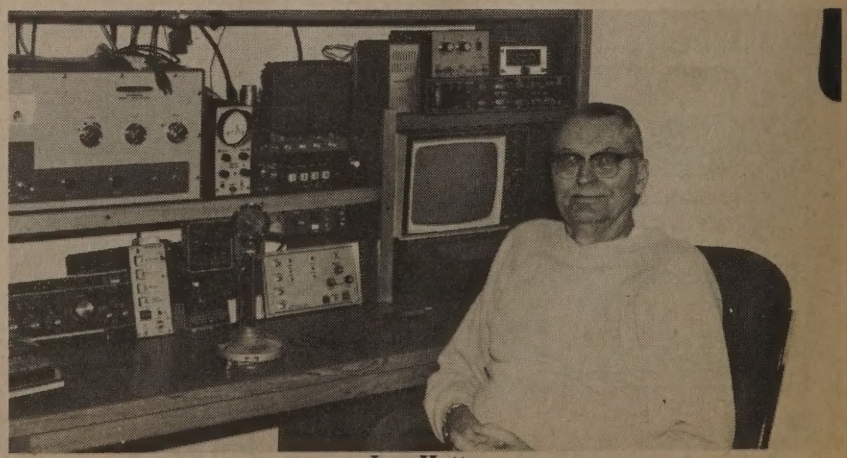
9) The nose cone with payload input/output. This includes the launchpad power supply, RS-232 connector, Pedot sensor tube and static air source.

All these modules fit into a payload tube 28 inches long and 2.6 inches in diameter. Powered with a J125 rocket engine, this payload can be carried to over 6000 feet!

On Oct. 29th, the ARGUS IV Rocket was ready for it's flight test. It was launched from Danville, Illinois. This was the site of a high-powered launch meet called Central Blast. There were several thousand acres of open farmland in which to loose our rocket here! Fortunately with the aid of the live camera this would not happen. The ARGUS IV was launched just before 2pm and made it to about 4000 feet or so. Watching the downlink video allowed everyone to go along on a very wild (and dizzying) ride due to the 2 revolution/sec. spin rate. The roll rate slowed down after burnout to 0.2 revs and gave us a nice ride back to earth, at least until the final impact without a parachute! Even though the parachute didn't deploy properly, damage was kept to a minimum due to the epoxy framework of the rocket.

The launch vehicle was assembled and donated by Tiffany Hobbies. It is their Crane, a 2.6 inch diameter rocket for 2.125 inch motors.





Lou Hutton
K7YZZ

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The first issue is expected to be out in January of 1989. Each issue should be at least 48 easy to read pages. That's 48 pages of useful information not 12 pages of ads for in house products and promotions.! Areas covered will be FSTV, SSTV, video and related subjects. Our internal text paste up is done on daisy wheel and laserjet printers . . . no hard to read dot matrix fonts!

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The AEA engineering standards of high performance are evident in this new transceiver. The FSTV 430 has a sensitive UHF GaAsfet preamp with a crystal controlled downconverter and IF filter (channel 3 or 4) for signal reception. The transmitter in the FSTV 430 uses a VSB (Vestigial Side Band) design to minimize adjacent channel interference. Two frequencies can be selected for transmission, one crystal is included.

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If you own a video camera, you should be on amateur television. Why not use your amateur radio and video skills together. The FSTV 430 makes putting two hobbies together easy and fun. Contact your local AEA dealer today for more information about the FSTV 430 from AEA.

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